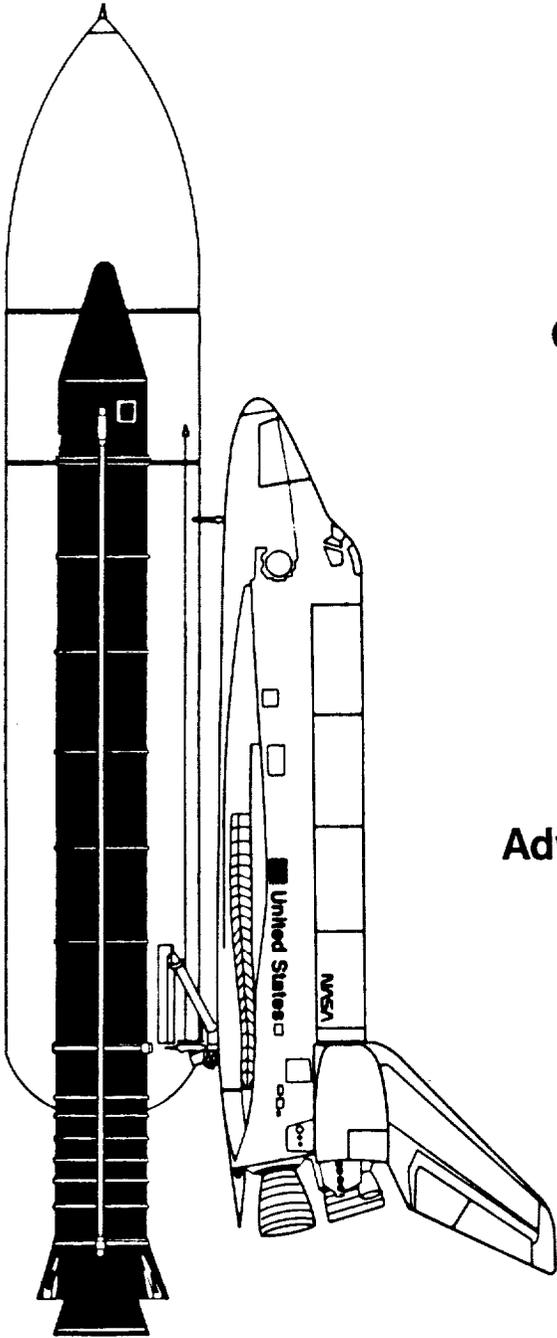


November 1990



Compilation of
Comment Letters and Responses
to the
SUPPLEMENTAL
FINAL
Environmental Impact Statement
Space Shuttle
Advanced Solid Rocket Motor Program



(NASA-TN-107819) COMPILATION OF COMMENT
LETTERS AND RESPONSES TO THE SUPPLEMENTAL
FINAL ENVIRONMENTAL IMPACT STATEMENT SPACE
SHUTTLE ADVANCED SOLID ROCKET MOTOR PROGRAM
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National Aeronautics and Space Administration
John C. Stennis Space Center
George C. Marshall Flight Center

**COMPILATION OF
COMMENT LETTERS AND RESPONSES TO THE
SUPPLEMENTAL FINAL ENVIRONMENTAL IMPACT STATEMENT
SPACE SHUTTLE ADVANCED SOLID ROCKET MOTOR PROGRAM**

RESPONSIBLE FEDERAL AGENCY:

National Aeronautics and Space Administration
Washington, D.C. 20546

AGENCY CONTACT:

Dr. Rebecca C. McCaleb
National Aeronautics and Space Administration
Building 1100, Code GAOO
Stennis Space Center, Mississippi 395290-6000

SUMMARY:

Following alternative procedures approved by the Council of Environmental Quality (CEQ) under Title 40 CFR, Section 1502.9 (c)(4) of the CEQ regulations, NASA prepared a Supplemental Final Environmental Impact Statement (SFEIS) for the Advanced Solid Rocket Motor Program (ASRM) in August, 1990. The comment letters and responses included herein were received during a 45-day public comment period following issuance of the SFEIS. The official comment period closed October 13, 1990. In addition, public meetings were held in the SSC vicinity on each of four consecutive nights from August 27-30, 1990, to discuss the SFEIS and directly answer questions. Approximately 600 people attended the four meetings. Five questions were not resolved at the meeting, and subsequent responses to those individuals expressing the questions are also included in the latter part of this compilation.

Twenty-one comment letters were received concerning the SFEIS. Six of the letters contained no questions or concerns. The main concerns expressed in the remaining comment letters were on the following issues: (1) potential vegetation damage; (2) effects on animals, especially the Florida panther; (3) humidity and inversion layer impact on plume rise; (4) acid rain impacts from unplanned events; (5) uncertainty as to adequacy of mitigation for direct and indirect impacts; (6) short- and long-term health impacts; (7) dispersion modeling validity and uncertainty; (8) exhaust product speciation and toxicity; (9) weather forecasting

ability; (10) effect on ozone in the stratosphere; (11) alternative propellants; (12) compliance with the new Clean Air Act; (13) accountability; (14) preparedness for an accidental ignition; (15) National Environmental Policy Act compliance and procedures; (16) static test configuration and siting; (17) deflector ramp design and efficiency; (18) defective motor disposal; and (19) economic impact. The majority of concerns and issues were addressed in the SFEIS or the ASRM Final Environmental Impact Statement issued in March, 1989. Citations and further clarification were offered in the responses. Additional questions and concerns directly related to the ASRM program at SSC were answered or noted for the record. Questions or concerns outside the scope of this SFEIS such as those related to ozone impacts in the stratosphere and operations at the Yellow Creek ASRM manufacturing facility were responded to or citations for further information on these subjects provided. The comment letters and responses are added to the official environmental record on the ASRM program.

LIST OF COMMENT LETTERS ON THE SPACE SHUTTLE ADVANCED SOLID ROCKET
MOTOR SUPPLEMENTAL FINAL ENVIRONMENTAL IMPACT STATEMENT

<u>Date Rcvd.</u>	<u>From</u>	<u>Letter No.</u>
10/1/90	Anne Bradburn, The Crosby Arboretum, Picayune, MS	1
10/09/90	James F. Puckett, M.D., Hattiesburg, MS	2
10/05/90	Heinz J. Mueller, EPA, Atlanta, GA	3
10/02/90	Lynne F. White, New Orleans, LA	4
10/02/90	Dwight Bradshaw, Robert Esher, Citizens for a Healthy Environment Waveland, MS	5
10/02/90	Robert J. Davis, Clermont Harbor, MS	6
10/01/90	Raymond A. Russell, Kiln, MS	7
09/28/90	Kenneth W. Holt, Department of Health & Human Services, Atlanta, GA	8
09/28/90	Edward G. McGregor, Army Corps of Engineers, Vicksburg, MS	9
09/28/90	W.F. Willis, Tennessee Valley Authority, Knoxville, TN	10
09/26/90	Lydia D. Schultz, Waveland, MS	11
09/21/90	Bertin C. Chevis, M.D., Hancock Medical Center, Bay St. Louis, MS	12
09/18/90	Jay Hanson, Kailua-Kona, HI	13
09/12/90	Claire J. Schiff, Summit, N.J.	14
09/10/90	Carolyn Masters, Hattiesburg, MS	15
09/07/90	Patrick J. Berrigan, Deutsch, Kerrigan & Stiles, New Orleans, LA	16
09/03/90	Kenneth W. Holt, Department of Health & Human Services, Atlanta, GA	17
08/31/90	Victor W. Lambou, Florida State University, Tallahassee, FL	18

**LIST OF COMMENT LETTERS ON THE SPACE SHUTTLE ADVANCED SOLID ROCKET
MOTOR SUPPLEMENTAL FINAL ENVIRONMENTAL IMPACT STATEMENT
(Continued)**

<u>Date Rcvd.</u>	<u>From</u>	<u>Letter No.</u>
08/31/90	Kenneth W. Holt, Department of Health & Human Services, Atlanta, GA	19
08/31/90	Bruce Pennington, Bay St. Louis, MS	20
08/15/90	Randy B. Shaw, Interpine Lumber Co. Picayune, MS	21

**LIST OF LETTERS IN RESPONSE TO WRITTEN QUESTIONS DURING THE
PUBLIC MEETINGS ON THE SPACE SHUTTLE ADVANCED SOLID ROCKET
MOTOR SUPPLEMENTAL FINAL ENVIRONMENTAL IMPACT STATEMENT**

<u>Date Sent</u>	<u>To</u>	<u>Letter No.</u>
09/14/90	Lydia Shultz, Waveland, MS	22
09/14/90	Buzz Nowak, Pearl River, LA	23
09/12/90	Carolyn Master, Hattiesburg, MS	24
09/12/90	Yvonne Hooge, New Orleans, LA	25
09/12/90	Barry Bagert, Covington, LA	26

Letter Number 1

from
Anne Bradburn
The Crosby Arboretum
Picayune, MS

COMMENTS

The Crosby Arboretum



A regional arboretum representing the native flora of the Pearl River drainage basin in Mississippi and Louisiana

Pearl River, Mississippi

1801 Goodwater Boulevard
Pearl River, Mississippi 39066
USA

Stennis Space Center

Rebecca C. McCaleb, PhD.
Environmental Projects Officer
National Aeronautics and Space Administration
John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

Dear Dr. McCaleb:

At its regular quarterly meeting on the afternoon of Friday, October 5, The Arboretum Board authorized me to respond to the Final Environmental Impact Statement (SPEIS) for the Advanced Solid Rocket Motor (ASRM) testing program proposed for Stennis Space Center.

We appreciate also receiving the five launch effects studies requested last May concerning vegetational stress resulting from Space Shuttle launches at Kennedy Space Center. In view of the fact that this informational package was not received by me until August 16, we hope that our comments will be included in the proposed review period for this most important project.

We agree that direct comparison of vegetational effects between the shuttle launches at Kennedy and the tests proposed for Stennis are not possible. However, we are not reassured by the five documents you have provided because:

1) All the reviews of post-launch vegetation are visual. There seems to be no documenting evidence of damage. My own observations at Kennedy revealed a complete absence of woody vegetation in the path reportedly taken by "most" shuttles. To date, we have seen no studies concerning possible effects on pine trees.

2) The data in the 1985 summary for 24 launches is based on nine and nineteen launches and does not contain valid data for the accumulated soil deposition from all launches. Literature cited (Poster Session #229 for the AAAS meeting in Philadelphia) is from government documents. None is listed from peer-reviewed scientific journals. Does NASA have valid information on accumulated impact on soils?

CA-1

CA-2

RESPONSES

CA-1

The water deluge system at the launch pad contributes to the direct acid deposition in the near-field (approximately 50 acres) around the launch pad at KSC. See Appendix E of the SPEIS. The Static Test Stand at SCC will have a deflector designed to withstand tests without cooling water. The immediate surrounding area of the test stand will be cleared of all trees and managed as a wetland meadow. Because of the low projected concentrations of HCl in the forest lands, no adverse impact is expected. A complete discussion of HCl and aluminum oxide deposition on plants was provided in Section 4.2.4 of the SPEIS.

CA-2

The information on soil analyses at KSC has only been published in the document you referenced. All analyses were performed by a technically qualified contractor using standard methods and are considered valid studies. Such studies are not normally reported in peer reviewed scientific journals.

CA-3

The deposition projections for static test firings were prepared with different models than used at KSC. SSC personnel have been and will continue to work on model verification to insure the highest quality of projections possible. A complete discussion of the models used in the projections of ASRM exhaust cloud dispersion and continuing validation efforts can be found in Sections 4.1 and 1.2 of the SPEIS, respectively.

CA-4

The estimated impacts to vegetation from ASRM testing are based on the ambient air concentrations of the exhaust products and depositions of particles. Since the ground-level air concentrations and depositions will be so low, there will be no adverse impact to resident vegetation as a result of the ASRM exhaust plume. No case studies of testing near pine forests have been conducted nor are any necessary because of the minimal predicted impacts from ASRM testing. See Section 4.2.4 of the SPEIS.

COMMENTS

RESPONSES

- CA-3 3) In two of the three Launch Effects Summary Reports provided the deposition pattern differs significantly from those expected from models. Can we expect better projections for Stennis?
From the FEIS itself we have the following comments.
- CA-4 1) We do not feel you have data to support your claim(4-44) that no adverse impacts will occur to vegetation from ASRM testing. Clearly there will be changes in the vegetational composition of adjacent areas. Have you any case studies for pine forests?
- CA-5 2) How can you be positive that a 2- to 4-hour, no-rain window is within the weather forecasting ability of your weather forecasting system?
- CA-6 3) The impact on the ozone layer of each test and the cumulative effects from all tests are not addressed.
- CA-7 4) No consideration is given to possible environmental damage caused by explosions on the pad. Uncontrolled fires spread rapidly through piney woods.
- CA-8 There are alternative propellants that can be used for rocket boosters. Why is NASA still planning to test solid rockets for the next 30 years?

We look forward to your responses to our concerns.

Sincerely,


Anne S. Bradburn, President

CA-5 NASA's on-site weather station combined with up-to-the-minute meteorological data from numerous other stations around SSC will provide NASA with complete profiles of the meteorological parameters necessary to assess the potential for rain. Additionally, NASA staff will perform simulation runs over the next few years in preparation for actual testing in 1994. See Section 1.2 and Appendix E, "Meteorological Principles Related to ASRM Test Plume Buoyancy and Behavior," in the SFERIS for a more complete discussion of meteorological forecasting and monitoring systems and principles.

CA-6 The exhaust from ASRM tests will not impact the ozone layer. The forms of chlorine in the exhaust are all soluble and will be removed from the lower atmosphere in 1 to 2 weeks. One or 2 weeks is not enough time for the chlorine to reach the stratosphere where it could react with ozone.

CA-7 The accident scenarios such as a case rupture during testing are examined in the FEIS (NASA, 1989).

CA-8 During the early phases of ASRM development, other forms of propulsion were considered including liquid boosters and hybrid (liquid/solid) boosters. Each type of propulsion system has inherent advantages and disadvantages in both technical capability and cost. Solid motors were chosen because they offer the greatest performance with lowest technical risk and cost.

NASA must consider current and future launch/mission requirements as well as technical and cost issues when planning propulsion systems and the proper mix of manned and unmanned spacecraft. NASA continues to be concerned about potential environmental effects associated with its activities. At the same time, NASA recognizes that almost any man-made activity and advances in technology may have some associated impacts. NASA attempts to balance its mission for space advancement with the impacts. Alternative propellants were addressed in Section 2.2.1 of the Space Shuttle Advanced Solid Rocket Motor Program Final Environmental Impact Statement, March 1989. Regardless, NASA continues to explore alternative technology and study the potential for adverse environmental consequences.

Letter Number 2

from
James F. Puckett, M.D.
Hattiesburg, MS

COMMENTS

RESPONSES

7 October 1990

Dear Dr. McCaleb,

I appreciate the efforts being made by the Stennis Space Center to thoroughly evaluate the consequences, positive and negative, of the proposed ASRM testing, and to include the concerns of the public in this process of evaluation.

I attended the Public Meeting in Picayune, 27 September where it was suggested that my thoughts concerning the scientific paper, EFFECTS OF SIMULATED ACID RAIN ON FINE ROOTS, CTOMYCORRHIZAE, MICROORGANISMS AND INVERTEBRATES IN THE FOREST FLOOR OF SOUTHERN PINE FORESTS, prepared by Dr. Robert Esher, et.al., be placed in writing and submitted as a part of the Record of Public Comment. I am writing to ask that my comments be so included.

As was pointed out to me at the Public Meeting, this article had at that time not been published in a juried journal. Be that as it may, I believe that the thesis of the research by Esher, et.al., is sound and has relevance to the proposed ASRM testing at Stennis. I appreciate the confidence of those who believe that there will be a high atmospheric dispersal of the ASRM exhaust, but the possibility exists that significant acid precipitation might occur.

I request that:

1. The article by Dr. Esher, et.al. (copy enclosed), be given a thorough evaluation as it relates to the possibility of significant acid precipitation, rather than high atmospheric dispersal, of the exhaust from ASRM testing at Stennis Space Center; and that this evaluation include a thorough treatment of the economic, as well as the biologic, consequences of this untoward event.

2. I further request that a study, or studies, similar to that of Esher, et.al., be conducted, in which the received ambient throughfall is not only acidified, but treated with such aluminum compounds as is necessary to approximate as closely as possible the character of the ASRM exhaust during test firing, before being applied to test plots; and that, as above, there be thorough treatment of the economic, as well as the biologic, consequences of such an occurrence.

Thank you for making possible the opportunity for me to become part of this evaluation process.

Sincerely,

James A. Bucklett, III

Comment noted.

The SPEIS contains an extensive analysis of the impacts due to total deposition in a rain event of all the HCl emitted from an ASRM test. The paper by Esher, et al., which you have enclosed does not directly address a single event "acid rain" scenario. From our understanding, the article was submitted to a professional journal/meeting. The following comments are offered as a perspective of the Esher, et al.'s study relative to ASRM testing and are not an attempt to preempt the peer review process to which the article has been submitted.

In the study by Esher, et al., the average ambient rainfall pH (throughfall) for 1987-88 and 1988-89 was 4.7 (3.9-6.2) and 4.5 (3.7-5.9), respectively. The average acidity (hydrogen ion concentration) was increased by factors of 2.5 and 12.5 for the pH 4.3 and 3.6 test plots, respectively, in 1987-88. The average acidity in 1988-89 was increased by factors of 1.6 and 7.9, respectively. Over the two year study period, average acidity of the rainfall events were increased by the above factors and reappplied to the test plots for a total of 65 times with the number of days between applications averaging 11.6. The authors found that the buffering capacity of the forest floor was sufficient to accommodate the sustained increases in acidic input.

In the Extension Forestry Newsletter No. 33 issued September, 1990, the Mississippi Cooperative Extension Service gave notice of the findings of the National Acid Precipitation Assessment Program 10-year study, costing \$100 million. Some of the findings include: (1) "Except for red spruce in high elevations, acid rain doesn't directly harm trees or other vegetation"; (2) "Acid rain does put stress on trees, but it is minor compared to the stress caused by insects, root diseases, temperature and ozone." The Mississippi Cooperative Extension Service is comprised of Mississippi State University, United States Department of Agriculture, and Cooperating Counties in Mississippi.

JFP-1

JFP-2

JFP-1

JFP-2

JFP-3

**EFFECTS OF SIMULATED ACID RAIN ON PINE ROOTS, ECTOMYCORRHIZAE,
MICROORGANISMS, AND INVERTEBRATES IN THE FOREST FLOOR OF SOUTHERN
PINE FORESTS.**

R. J. Esher, D. H. Marx, S. J. Urric, R. L. Baker, L. R. Brown, D.
C. Coleman

(Article included in letter but not reproduced due to potential
copyright infringement.)

NASA is currently planning 63 tests over the 30 year projected life of the ASRM static test program. The infrequency of ASRM testing, the short duration of each test, the weather restrictions committed to by NASA, and the requirements of the State of Mississippi in the prevention of Significant Deterioration Permit (still pending), eliminate potential for cumulative acid rain impacts from ASRM testing. Data from the Esher, et al., study correlates with our projections that the soil in the SSC vicinity can buffer the effects of an unplanned event should rain fall through an ASRM exhaust cloud prior to adequate dispersal. However, to maintain an active permit to test ASRM's in Mississippi assuming one is granted, NASA can only test during "no rain" conditions. To do otherwise will result in permit suspension or termination until the problem is resolved.

JFP-3

The Prevention of Significant Deterioration Draft Permit released by the Mississippi Department of Environmental Quality is a very restrictive permit. NASA must assure that the ASRM exhaust cloud will disperse at least equal or better than predicted in the application. The draft permit contains numerous restrictions and requirements for plans and monitoring. NASA will implement each of the plans according to the review and approval of the Mississippi Department of Environmental Quality. Meeting the terms of the permit will assure that the public and environment are protected. Your concerns were addressed through the permitting process and development of the requirements that must be fulfilled prior to and during the ASRM static test program. The SSC Environmental Assurance Program was discussed in Section 1.7 of the SPEIS.

Letter Number 3

from
Heinz J. Mueller, EPA
Atlanta, GA

COMMENTS

RESPONSES



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET NE
ATLANTA GEORGIA 30365

OCT 1 1990

National Aeronautics and Space Administration
ATTN: GAOO/Environmental Projects Officer
John C. Stennis Space Center, MS 39529-6000

Subject: Supplemental Final Environmental Impact Statement
(SFEIS) on the Space Shuttle Advanced Solid Motor
Program

Dear Dr. McCaleb:

Pursuant to Section 309 of the Clean Air Act and Section 102 (2)(C) of the National Environmental Policy Act (NEPA), EPA, Region IV has reviewed the subject document. The proposed action involves the construction and operation of various test facilities attendant to testing the advanced solid rocket motor (ASRM). The ASRM will replace the engines currently powering the space shuttle. Specific construction includes a barge/dock operation, a test firing stand and associated support buildings, and transportation access to move the ASRM from the barge dock to the test stand.

The text of the SFEIS is remarkable in comparison to previous iterations through its use of plain language descriptions of proposed actions and administrative processes. This furthers the NEPA goal that an EIS will serve as a source of usable information to the overall public in regard to eventual decision-making. A Section 404 Public Notice which addresses the important issue of wetland losses associated with fill accompanying this construction is also currently under review. Many of the issues noted in this response are also pertinent and will be repeated in that review.

As a result of the January 23, 1990, interagency meeting and the information in this supplemental document, regional technical staff have been considering the various environmental ramifications of the above proposal, especially those associated with the unavoidable wetland losses. There are a number of human health and safety aspects relating to the long-term operation of this facility which have engendered a great deal of comment. Foremost among these would be the direct and indirect biological effects of the various combustion products generated by the rocket motors. The human health issues focus on an area of expertise which are generally beyond the purview/expertise of EPA.

COMMENTS

RESPONSES

The issues/observations pertinent to EPA's mandated area of interest were determined from our evaluation of the supplemental information together with coordination of the in-house staff and conversations with other federal and state agency counterparts. They are contained in the attached detailed comments.

On the basis of our review a rating of EC-2 was assigned. That is, notwithstanding the additional information contained in this document, we continue to have a degree of environmental concern about achieving the necessary mitigation for all the direct and indirect consequences to the natural environment resulting from this proposal. More information will be acquired during the course of the on-going interagency coordination to develop the mitigation plan for the initial, direct wetland habitat losses. The insights gained during and after this study/dialogue will be necessary to address our present concerns about the losses attendant to construction. The monitoring plan associated with the State of Mississippi's air permit (PSD) will also specifically provide the means to ascertain whether air emissions are affecting downwind wetland communities. If these effects prove to be significant, additional measures will be necessary.

Thank you for the opportunity to comment. If we can be of further assistance, Dr. Gerald Miller (PTS 257-3776) will serve as our initial point of contact.

Sincerely yours,

Heinz J. Mueller

Heinz J. Mueller, Chief
Environmental Policy Section
Federal Activities Branch

COMMENTS

Specific Comments

For convenience the subject wetland losses, per se, resulting from this action are characterized under the heading of direct and indirect/induced impacts. Field experience at SSC, and information in the SFEIS, and subsequent consultation among the principals revealed two major vegetation types will be primarily impacted by the construction immediately resulting from the proposed test stand. A pine/pine savannah (PPS) habitat comprises the majority of the site while a bottomland hardwood (BH) community is more usually confined to its two major drainways. Small amounts of the pitcher plant habitat will be affected by the proposed construction due to its presence in disturbed sites. These losses, while regrettable, are not considered to be significant. Measures have been discussed/proposed to reconstitute habitat favorable to colonization of these taxa.

EPA-1

Various mitigation measures have been proposed to compensate for the two wetland types. In broad outline the mitigation plan currently proposed by the applicant observes correctly that there is the potential to reconstruct a reasonable semblance of the original drainage patterns found in the PPS. This could easily be done on a relatively large percentage of this habitat type in the various test stand exclusion zones throughout SSC. If pine monoculture were discontinued after the present merchantable timber was harvested, much of the original habitat and water quality characteristics on this acreage would be reconstituted. This habitat could mitigate for the losses in this instance and perhaps for future operational activities at SSC. How much acreage would be involved in this mitigation program remains to be determined, but is a matter of great interest to the state and federal resource agencies. A determination will be made based on the results of the evaluations of functional value using the Bottomland Hardwood Wetland Evaluation Technique (BLH-WET). Technical staff recently (September 18-19) began this process by delineating the specific areas on which mitigation for unavoidable losses would be most appropriate.

EPA-2

While it is conceptually feasible to mitigate for these two habitats, the functional results of such attempts are sometimes not totally successful. There are also any number of practical matters which can preclude this being an easy endeavor. The degree of resultant difficulty will require significant attention by the involved principals immediately. This will preclude problems in the future and avoid the possibility that construction schedules would have to be altered to remain in step with mitigation measures.

EPA-3

RESPONSES

EPA-1 Comment noted.

EPA-2 Comment noted.

EPA-3 Comment noted.

COMMENTS

RESPONSES

- EPA-4** During previous interagency discussions we have suggested that the use of advanced mitigation for the anticipated additional test stands as well as the potential operation losses associated with the subject facility be given consideration. This would allow compensation of development activities to precede losses rather than the more usual reciprocal situation. However, there is a potential problem. Namely, any improvement to the natural environment resulting from influencing floral succession by these measures could be infliated by the long-term effect(s) on some species by rocket motor emissions. Hence, there is a very real need to determine the biotic effect(s) of the motor's combustion products. This will be one of the primary objectives of the monitoring plan.
- EPA-5** This monitoring plan is essential precisely due to the matter of secondary effects of motor testing, i.e., the impact of combustion products on the surrounding ecosystem. Part 230-Section 404 (b)(1) Guidelines, especially Subpart B is relevant to this situation. Specifically, note Section 230.10 which states in part that no discharge of dredged or fill material shall be permitted which shall cause or contribute to significant degradation including the transfer, concentration, and spread of pollutants or their by-products outside of the disposal site through biological, physical, and chemical processes.
- EPA-6** The discussions in Section 230.11, especially (h)-Determination of secondary effects on the aquatic ecosystem, directly speak to effects that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material. The Guidelines relate that activities conducted on fast land created by the discharge of dredged or fill material which may have secondary impacts within those waters should be considered in evaluating the impact of creating those fast lands. This would seem to immediately parallel the situation with which we are faced at the NASA site relative to the rocket motor emissions.
- EPA-7** There are at least two issues of importance which evolve in this regard, viz., the degree/significance of degradation of the noted waters from emissions produced during the rocket motor testing and the amount of mitigation for these offsite impacts. NASA has confidently stated that these emissions will be sufficiently dispersed upon their return to ground level at SSC and its environs such that no significant degradation will result.
- This viewpoint is not universally shared among certain segments of the interested public. Research and published literature tend to suggest that certain plant species are adversely affected by relatively small inputs of acid precipitation which

EPA-4 Data, either from the modeling at SSC or at existing solid rocket motor testing sites, do not indicate any long-term effects due to exhaust emissions. The SFEIS does determine the biotic effects of ASRM testing under worst-case type scenarios. ASRM testing will not adversely impact the biota. Regardless of this, a monitoring program for air quality, deposition, and plant life is discussed in Section 1.2 of the SFEIS.

EPA-5 A monitoring plan will be required by the Mississippi Department of Environmental Quality (DEQ) as a condition of the prevention of Significant Deterioration Air Emissions Permit. The plan which must be reviewed and approved by the DEQ will assure that the characterization, deposition, and impact analysis of combustion products is properly addressed and documented. See Section 1.2 of the SFEIS.

EPA-6 As demonstrated according to EPA methodology in the SFEIS and stated in response EPA-4, no secondary impacts to wetlands will result from ASRM test emissions.

EPA-7 We agree. Emissions will be sufficiently dispersed upon their return to ground level. Mitigation of the plume has been accounted for in the dispersion modeling.

COMMENTS

RESPONSES

EPA-8 could result from motor combustion products. Observations of water quality degradation found in the NEPA documentation for NASA operations at its Cape Kennedy facility add credence to the suggestions that the by-products of motor operation can cause observable changes in life cycles of susceptible, PROXIMATE biota.

EPA-9 At this point EPA has not reached a final decision regarding the biological significance of the perturbations associated with these combustion emissions, but it does appear to warrant further study pursuant to Section 230.61 (Chemical, biological, and physical evaluation and testing) of the Guidelines. We are relatively confident that appropriate remote sensing techniques (associated with the monitoring plan associated with the PSD permit) can be used to ascertain potential impacts on the natural component of the environment. However, whether any epidemiological studies will need to be conducted to determine the effects of emissions exposure on the local/regional human component of the environment remain to be seen.

EPA-10 The issue of water dependency is important in the Section 404 (b)(1) Guidelines, i.e., the motor testing does not require access or proximity to water to fulfill its basic purpose. Nonetheless, NASA strongly prefers to transport the rocket motors to SSC from the Yellow River fabrication site via barge cargo which are and have been subject to damage during rail shipment. Notwithstanding the motors' size, they are relatively fragile and sensitive to impacts even those on their shrouding. NASA observes there is no practical way to protect its engines when they are in transit via rail. The current 404 (b)(1) guidance provides criteria for determining whether an alternative site is practicable from this perspective.

EPA-11 A number of potential sites were already eliminated in the Environmental Impact Statement analysis, thereby making a case for selection of SSC as the testing location due to its barge access. However, the matter is complicated by the fact that NASA is currently testing these rocket motors at a Utah facility. Therefore, on the face of it a practicable alternative is available which does not require the use of a special aquatic site. Additionally, the use of the Utah site which is in a much drier climate with different edaphic characteristics lessens the potential long-term biotic impacts from the rocket motor combustion emissions. This issue and its resolution continue to perplex us.

EPA has reviewed the air quality modeling data and associated protocol used to assess the impacts of the static firing/open burning of waste propellant. In our comments to the original

EPA-8 NASA acknowledges that its viewpoint is not universally shared. We have given specific details and assumptions for all the conclusions reached. Neither EPA nor other commentors have cited any specific research or published literature that persuasively supports the argument that NASA's analyses are incorrect. Furthermore, with regard to water quality impacts observed at Kennedy Space Center, the FEIS clearly indicates that these effects are related primarily to the use of a water deluge or quenching system during launch at KSC (NASA, 1989, page 5-9). No such system will be used at SSC during testing, and NASA therefore disagrees with EPA's assertion that observed effects at KSC during launches "lend credence to the belief that similar effects might occur at SSC during testing. It is important to differentiate effects from launching versus effects of ASRM testing. However, the FEIS, in Section 4.3, does discuss in detail the effects resulting from an unexpected condition of a large rain event one hour after an ASRM test.

Comment noted.

EPA-9 Potential, dependable rail movement of the significantly larger ASRM segments over the current space shuttle solid rocket motors (SRM) is doubtful. The record of impacts to NASA rail containers with SRM segments is high, although many were minor in nature. The static test stand and support infrastructure at SSC cannot avoid wetlands due to their predominance. NASA has made every effort to minimize physical and functional loss of wetlands and prepare a sound mitigation approach for compensation of the losses. Static test sites and transportation alternatives were subjects of the Space Shuttle Advanced Solid Rocket Motor Program Final Environmental Impact Statement, March, 1989.

EPA-10 There are no data suggesting that the drier climate in Utah changes the environmental impacts of solid rocket motor testing. NASA does not own a site in Utah suitable for testing solid rocket motors, and no private Utah site was proposed. Please refer to Appendix E of the FEIS for a discussion of meteorological principles related to plume behavior and rise in a humid versus a dry climate. See also answer EPA-10.

EPA-11

COMMENTS

EPA-12

EIS we did not agree that the PCAD model chosen by NASA was appropriate. This fact was made known to Mr. Dwight Wylie, Mississippi Bureau of Pollution Control, in a letter dated August of 1989. In this letter EPA's Regional Air Programs Branch also commented on the need to address the effects of the aluminum oxide particulate emissions on the area's aquatic resources and the ground level impacts/concentration of TSP, HCl, and Cl. Based on the modeling information in this document, it appears that an appropriate combination model has now been used. The resultant data indicate that all the calculated concentrations should be below the thresholds established for the pollutants of concern. The monitoring associated with the PSD permit will be used to determine if the mitigation for the unavoidable losses associated with the primary wetland losses is being adversely affected. Additional measures will have to be taken if this proves to be the case.

EPA-13

Aluminum compounds are widely present in the environment and are not usually viewed as posing a health problem. There is, however, a degree of concern regarding the use of aluminum pyrotechnic flake (powder) in the fuel mixture. This may be of special significance from an environmental medicine perspective because pulmonary disease among workers exposed to aluminum powder closely tracks with exposure to submicron-sized aluminum (less than 5 microns). Mitchell (1959) reported on a case of pulmonary fibrosis from inhalation of a heavy concentration of pyropowder. Autopsy revealed a generalized non-nodular fibrosis and interstitial emphysema with right ventricular hypertrophy. This case is germane because the worker was only 22 years old, hence it is unlikely that these adverse health effects were secondary to chronic, long-term exposure.

EPA-14

Mitchell further evaluated this case in 1961 and found that of 27 workmen with heavy exposures to aluminum powder in the same plant, 6 were found to have evidence of pulmonary fibrosis. He concluded that the finer dust was more dangerous than coarse particles. This work reinforces the point that there should be greater concern about the possible evolution of submicron-sized aluminum pyrotechnic powder in the plume. EPA is seeking additional information on this matter.

References:

- Mitchell J.: Pulmonary fibrosis in an aluminum worker. British Journal of Industrial Medicine 16:123-125, 1959.
- Mitchell J., Manning, G.B., Molyneux, M., and Lane, R.E.: Pulmonary fibrosis in workers exposed to finely powdered aluminum. British Journal of Industrial Medicine 18:10-20, 1961.

RESPONSES

EPA-12

No critique of modeling was found in the EPA response to the original EIS (original letter attached). Otherwise, comment noted.

EPA-13

It must be emphasized that the pulmonary fibrosis cases observed by Mitchell and cited by the EPA in their comments are not entirely applicable to emissions from ASRM testing for two reasons: 1) aluminum from ASRM testing has been determined to be nonfibrous aluminum oxide. The EPA recently removed nonfibrous aluminum oxide from their list of toxic chemicals because, in EPA's determination, aluminum oxide is not expected to cause acute or chronic health effects or environmental toxicity (Federal Register, 1990); and 2) the expected concentrations of aluminum oxide are exceedingly small compared to those concentrations of aluminum pyropowder required to cause pulmonary fibrosis. Please refer to Section 5.0, "Human Health Effects", of the SPEIS for a complete discussion.

EPA-14

The concentration of aluminum dust below 5 microns in the plant where these workers were employed was on the order of 19 mg/m³ as a time-weighted average concentration. In contrast, the 24-hour time-weighted average aluminum oxide concentration from ASRM testing is over 1,200 times lower. In addition, only a total of 64 tests (maximum of 120) are planned for the ASRM static test program over 30 years. The combination of low concentration and the relatively benign nature of aluminum oxide led to the conclusion that no adverse effects will occur. See Section 5.0 of the SPEIS.

FEB 6 1989

FEB 09 1989

LETTER NO. 7

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30306

FEB 6 1989

Letter from EPA on the
ASPM Draft EIS, December, 1988.

4PM-2A/CJM

Mr. Rebecca C. McCallab
National Aeronautics and Space Administration
Building 2423
Stennis Space Center, MS 39529-6000

SUBJECT: Draft Environmental Impact Statement (DEIS) for the Proposed
National Aeronautics and Space Administration (NASA) Advanced
Solid Rocket Motor Program (Mississippi/Florida)
EPA Log No.: D-889-EI 2003-00

Dear Mr. McCallab:

Under the authority of Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA), EPA Region IV has reviewed the subject document. In the main we note that the proposal, per se, and the alternatives to accomplish the replacement of the rocket motors currently used in the launch of the Space Shuttle were well documented and the options reasonably evaluated. On balance it appears that NASA's preferred alternative to produce the engines at the Yellor Creek Site (Mississippi) and test them at the Stennis Space Center (Mississippi) would minimize the environmental consequences of the action within the constraints of the project's objectives. There are, however, a number of questions about the degree of wetland impacts associated with this option which need to be resolved in the Final EIS (see attached Detailed Comments).

On the basis of our review a rating of EC-2 was assigned to this NEPA action. That is, we have some environmental concerns about the amount of wetlands which may be impacted to accomplish this mission. Additional information regarding whether these losses are unavoidable should be provided in the final document.

If we can be of further assistance in this matter, Dr. Gerald J. Miller (404-347-3776) of the NEPA Review Staff will serve as our point of contact.

Sincerely,

James J. Mueller

James J. Mueller, Acting Chief
NEPA Review Staff
Environmental Assessment Branch

Attachment

Detailed Comments

According to the DEIS, the vegetative reconnaissance conducted by Zaher and Bradshaw (1988) did not reveal any Section 404 jurisdictional wetlands within the ASPM site at the Stennis Space Center (SSC). However, the characterization of the vegetation within the subject bottomland hardwood and pitcher plant bog communities (Figure 3-5) suggests to us that these areas would probably come within the purview of the Section 404 program. An EPA staff member contacted at the SSC was of the same opinion after a qualitative appraisal of the area. Regardless, the apparent discrepancy needs to be reconciled as soon as possible. We suggest that the Mobile District, Corps of Engineers be contacted to provide a jurisdictional determination for the areas in question. If any jurisdictional wetlands are delineated at the site it may be possible to locate/orient the major structural features of the facility to minimize losses in this regard. State and Federal resource agencies are available to work with NASA to develop a mutually acceptable mitigation plan for any remaining unavoidable environmental losses.

In a related matter the impacts of the project on the floodplains of Wolf and Lion Branches at SSC were characterized as having significance, but the actual effects were not detailed. It was noted that there may be some impairment of water quality in the Jourdan River, but the kind or degree of impact(s) were not given. The specifics of altering the drainage patterns on the two branches and how this could impact the Jourdan River need to be assessed in the Final EIS. We suggest that the Bureau of Marine Resources at Biloxi be contacted if assistance is needed since its staff has detailed knowledge of the area together with any existing environmental problems there.

If any additional dredging (further upgrades/increasing maintenance frequency) will be necessary to accommodate transporting the rocket components from SSC to the Kennedy Space Center (KSC), this should be assessed in the Final EIS. Any additional upgrades to the road network at SSC necessary for engine transport also need to be evaluated during the NEPA process, especially if construction will impact biologically sensitive areas.

On the basis of the information provided it appears that Area C would be the environmentally preferred site for the ASPM facilities if it were to be located at SSC. It has been our experience that the magnitude of the wetland creation/enhancement necessary to mitigate the losses at Area B area(s) would have to be altered to effect this conversion. Moreover, Area C has the added advantage of being located above the 100-year floodplain which should lessen the potential for flooding and the need to alter adjacent drainage. However, before a final determination can be made on this site the U.S. Fish and Wildlife Service will have to make a biological assessment on the endangered species which would be impacted by construction and operation activity.

Letter Number 4

from
Lynne F. White
New Orleans, LA

COMMENTS

RESPONSES

LYNNE F. WHITE
2618 COLISEUM STREET
NEW ORLEANS LA 70130-5762
504-895 1203

October 1, 1990

Dr. Rebecca McCaleb
NASA Environmental Officer
Code GA00
Stennis Space Center, MS 39529-6000

Dear Dr. McCaleb:

I feel a future supplement is needed on the test-firing of the ASRM at SSC to address the following:

I. ROCKET MOTOR EMISSIONS ON AND OFF SITE

- A. A new comprehensive examination of the impact of each test firing on stratospheric ozone depletion, considering not only hydrochloric acid but also the role of aluminum oxide. (See FEIS of the Ulysses Mission (Tier 2), June, 1990, Pg. 4-5.)
- B. A nonbias realistic study on the impact of the cumulative consequences of all launch and test firings by NASA, the Air Force (Titan IV missiles) and private companies. What is the total impact on the chlorine/ozone problem and how do they all effect local and international biota?
- C. Your responsibility to the world community.

LFW-1

LFW-2

LFW-3

The exhaust from ASRM tests will not impact the ozone layer. The forms of chlorine in the exhaust are all soluble and will be removed from the lower atmosphere in 1 to 2 weeks. Similarly, the particulate matter will remain suspended for about 2 weeks. One to 2 weeks is not enough time for the chlorine to reach the stratosphere where it could react with ozone. The role of aluminum oxide particles in ozone destruction is not understood. However, the particles would not be able to reach the stratosphere and, therefore, could not interact with ozone or any other compounds in the stratosphere.

LFW-1

As stated in response LFW-1, solid rocket test firings cannot impact the ozone layer. After over 20 years of testing solid rocket motors at numerous sites across the country, no cumulative impacts to biota or humans have been observed. In a report to Congress by Watson et al., 1990, the impact on stratospheric ozone was considered for a scenario of a continuous series of nine Shuttle and six Titan IV launches per year. Ozone depletions were estimated to be less than 0.25 percent locally and less than 0.1 percent in the total column. NASA is committed to continuing an evaluation of the overall environmental effects of launch and static tests.

LFW-2

The data will be collected by the U.S. Environmental Protection Agency (EPA). The Global Change Office, EPA Headquarters, Washington D.C. has been tasked with this requirement. NASA will participate in this evaluation as requested by EPA.

LFW-3

The impact analysis was addressed in LFW-2.

LFW-4

The predicted deposition of aluminum oxide resulting from ASRM testing is not expected to be measurable in surface waters. Although the predicted deposition of aluminum oxide is very small, the solubility of aluminum oxide and the potential mobilization of naturally occurring aluminum due to increased acidity from ASRM testing was specifically addressed in the FEIS, Section 4.2.4. Under acidic conditions, many metals may be mobilized, including aluminum. The degree of mobilization and the fate of mobilized metals is chemical and site-specific. Although site-specific data are not available, it is generally accepted that mobilized aluminum is rapidly complexed with organic (humic and fulvic) acids. Where organic acids are not present in sufficient quantity, mobilized aluminum may not be completely complexed, and the toxicity of the waters may increase. In the waters

LFW-5

COMMENTS

RESPONSES

Dr. Rebecca McCaleb
NASA Environmental Officer
Stennis Space Center, MS

October 1, 1990

Page Two

LFW-4

b. Canadian Professor Nicholas Matte, Director of McGill University's Center for Research of Air and Space Law, has called for a global agreement to control chemical emission from spacecraft. See Enclosure #2. How will you explain major emission pollution to the international community? What will you say?

LFW-5

D. New up-to-date research is needed to understand the long-term cumulative effects of the solubility of aluminum oxide on lower pHs soil and water in the SSC environs. Your research is outdated.

LFW-6

E. At KSC there is a path of no Myrica cariflora L. (wax myrtle) that corresponds with the paths taken by 80 percent of the plumes. This woody plant material has been killed and replaced by grasses. SSC is surrounded by lush woody vegetation and trees. What research have you done on the long-term effects of HCl and aluminum oxide on trees and woody plants?

LFW-7

F. A proposed revision of the Clean Air Act would limit emissions of hydrochloric acid and chlorine. How can you comply to this Clean Air legislation? This is a new test site on an existing test site property.

LFW-8

G. KSC is 20 percent land and 80 percent water but the fallout is effecting the citrus groves. Thokol Corp. is doing research at the University of Illinois on a more environmentally friendly fuel, i.e. ammonium nitrate. What research is NASA doing on alternative fuels? What will the fallout be to an area around SSC that is 100 percent land?

of southeastern United States, however, high concentrations of organic acids are expected to complex all aluminum that is mobilized. To verify NASA's projections, site-specific data will be collected as part of a comprehensive monitoring plan.

LFW-6

NASA has not conducted specific research experiments on the effects of HCl and aluminum oxide on plants and trees. The published data relevant to the ASRM testing at SSC are referenced in both the FEIS (NASA, 1989) and the SFEIS. It is typical to use existing published data as opposed to collecting site-specific data or performing research. NASA's evaluations have shown that the concentrations and depositions of exhaust compounds will be very low and very infrequent. Cumulative effects of plants and soils were discussed in Section 4.4 of the SFEIS.

LFW-7

The Clean Air Act, currently formulated with proposed revisions, does not set standards for emissions of specific compounds such as HCl. The Act does, however, empower EPA to develop regulatory standards for specific compounds. Existing standards and guidelines for HCl are presented in the SFEIS. As demonstrated in the SFEIS, ASRM testing will comply with all existing standards and guidelines (see Sections 4.2.1 and 5.0). Any new standards or requirements for control technologies must be implemented wherever NASA conducts this test activity.

LFW-8

There is only one documented event of a solid rocket motor exhaust plume affecting a citrus grove. This occurred during a large, experimental solid motor was tested during a rain event in the mid-1960s. A discussion of this event was provided in Section 4.3.4 of the SFEIS. It is primarily because of this event that NASA has decided not to test solid motors when rain is predicted. Space shuttle launches produce an acid rain mist which may settle on the property of KSC. The mist is produced when thousands of gallons of water are sprayed onto the launch pad just prior to and during launch to protect the launch pad (see Appendix E of the SFEIS). Since ASRM tests will not use a water deluge system, the impacts at KSC are not comparable to SSC.

The depositions of aluminum oxide on and around SSC are given in the SFEIS, Section 4. See answer LFW-13 for a discussion of alternative propellants.

COMMENTS

Dr. Rebecca McCaleb
NASA Environmental Officer
Stennis Space Center, MS

October 1, 1990
Page Three

RESPONSES

- II. ADVERSITIES**
- LFW-9** | A. Operation issue. If monitoring reveals adversities outside the boundary, what will be done? Will the program be shut down?
- LFW-10** | B. Who will be legally responsible for damage to automobiles if there is an accident and hydrochloric acid falls on Interstate 10 and Highways 603 and 607?
- LFW-11** | C. What provisions have been made for a motor accidentally exploding, i.e. September 8, 1990 at Edwards Air Force Base, CA? An uncontrollable "ferocious blaze" could destroy timber farms and homes. What evacuation procedures do you have for the local community? Who will pay for the damage? See Enclosure #1.
- III. NASA'S CREDIBILITY**
- LFW-12** | A. In 1974 NASA Administrator James Fletcher in a speech to the National Space Club in Washington, D.C. said:
- "...our continuing studies have shown that the hydrogen chloride in the booster exhaust may give rise to free chlorine in the stratosphere, which laboratory experiments indicate might catalyze the destruction of some stratospheric ozone. There are, however, no data to show that this actually happens and it is an extremely complicated question that we will continue to study. We fully expect that this will not turn out to be a problem but should the effects turn out to be unacceptable, there are alternative propellants that we can use in the rocket booster and we will do so."
- See Enclosure #4, pg. 141.
- LFW-9** | If pollutant levels higher than respective standards protective of the public are exceeded, ASRM testing will be suspended until the problem is identified and resolved, a commitment made by NASA in the SFEIS, page xix.
- LFW-10** | NASA has authority to pay for damages caused by its operations. If claims for damages are received and we find the damage was caused by the NASA operation, we routinely pay for the damage.
- LFW-11** | The accident scenarios have been addressed in full in the Space Shuttle Advanced Solid Rocket Motor Program Final Environmental Impact Statement, March, 1990 and Section 5.6.1 of the SFEIS. Additionally, NASA will prepare and implement an emergency response plan for all potential accidents and unplanned events. This plan will have the input of local emergency planning committees and the Mississippi Department of Environmental Quality.
- LFW-12** | NASA continues to sponsor studies on the stratospheric ozone issue, primarily at Goddard Space Institute, Goddard Space Flight Center, and Langley Research Center. A report on current estimations of impact was addressed in answer LFW-2.

COMMENTS

RESPONSES

Dr. Rebecca McCaleb
NASA Environmental Officer
Stennis Space Center, MS

October 1, 1990

Page Four

LFW-13

From 1974 to 1990, there has been data to show that hydrogen chloride is destroying stratospheric ozone, but where are the alternative propellants?

When the Administrator of NASA does not live up to his word, you begin to understand why NASA has lost its credibility. Scientific technology has been traded for politics.

LFW-14

What alternative propellants was Fletcher referring to? Why has NASA stuck with this present solid fuel knowing it is destructive to the environment?

I would appreciate your responding to my statements and questions.

Yours very truly,


Lynne F. White

Enclosures (4)

cc: Vice President Dan Quayle
Chairman, National Space Council
The White House
Washington, D.C. 20500

Mr. Norman Augustine
Chairman, Future of US Space Commission
Martin Marietta Corporation
6801 Rockledge Drive
Bethesda, MD 20817

Dr. Gerald Miller
Environmental Policy Section of US EPA
345 Courtland Street, N.E.
Atlanta, GA 30365

Honorable Richard H. Truly
Administrator
National Aeronautics and Space Administration
Washington, D.C. 20546

LFW-13

During the early phases of ASRM development, other forms of propulsion were considered including liquid boosters and hybrid (liquid/solid) boosters. Each type of propulsion system has inherent advantages and disadvantages in both technical capability and cost. Solid motors were chosen because they offer the greatest performance with lowest technical risk and cost.

NASA must consider current and future launch/mision requirements as well as technical and cost issues when planning propulsion systems and the proper mix of manned and unmanned spacecraft. NASA continues to be concerned about potential environmental effects associated with its activities. At the same time, NASA recognizes that almost any man-made activity and advances in technology may have some associated impacts. NASA attempts to balance its mission for space advancement with the impacts. Alternative propellants were addressed in Section 2.2.1 of the Space Shuttle Advanced Solid Rocket Motor Program Final Environmental Impact Statement, March 1989. Regardless, NASA continues to explore alternative technology and study the potential for adverse environmental consequences.

Refer to response LFW-13.

LFW-14



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

EXHIBIT

OFFICE OF
AIR AND CLIMATE ACTION

MEMORANDUM

SUBJECT: Agreements Reached in London to Strengthen the Montreal Protocol

FROM: Eileen Clausen
Director
Office of Atmospheric and Indoor Air Programs

TO: Federal Advisory Council on Stratospheric Ozone
Protection

The London Meeting

I want to thank each of you for your assistance and support in our efforts leading up to the London meeting of the Parties to the Montreal Protocol. Rather than bringing you all together during the summer to go over what took place, I thought I'd give you a brief summary here and arrange a meeting sometime in September.

The London meeting successfully concluded late on Friday, June 29, 1990, with the unanimous adoption of substantially tighter controls on ozone-depleting chemicals. The Parties also agreed to the establishment of a financial mechanism to support technology transfer to developing nations. The adoption of the financial mechanism, in particular, made it possible for India and China to announce that they would join the Protocol as soon as possible.

The control measures adopted were pretty much as we had discussed at our last meeting. The amended Protocol calls for phasing out the CFCs and halons listed in the Protocol by the year 2000, with an exemption for essential uses of halons. It also requires a 2000 phase-out of other fully halogenated CFCs not currently listed in the Protocol. Carbon tetrachloride and methyl chloroform were added to the list of ozone-depleting chemicals and are required to be phased out by the year 2000 and 2005, respectively.

The CFC interim reductions and phase-out date, along with the methyl chloroform reduction schedule were contentious issues. The European Community, the Mordica, Canada, Australia, and New Zealand argued strongly for much steeper interim cuts and a 1997 phase-out date for CFCs. In fact, 13 nations issued a statement

declaring their intent to phase out by 1997. We strongly opposed the substantially deeper early cuts and the 1997 phase-out, but agreed that an assessment should be undertaken in time for the 1992 meeting of the Parties to determine if an earlier phase-out is feasible.

The Mordics pressed hard for much steeper cuts in methyl chloroform. We hope that the scheduled reductions and 2005 phase-out that was agreed to by the Parties comes as close as possible to the likely compromise that will be contained in the Clean Air Act (CAA). We also have an international obligation to assess whether an earlier phase-out date for methyl chloroform is feasible, and to have this assessment considered at the 1992 meeting of the Parties.

The Parties could not agree on a Protocol amendment to add controls on HCFCs. Instead they agreed to a resolution requiring use limits. The resolution requires Parties to limit HCFCs to uses only where other alternatives are not feasible. It also calls for a phase-out by 2020 if feasible, but no later than 2040. Furthermore, the resolution states that the Parties will reexamine whether restrictions and/or a phase-out date for HCFCs should be set as part of the Protocol. A report on the progress of the phase-out for all chemicals, and on the economic and technical feasibility of meeting specific deadlines set forth in the Protocol is due in 1992. At that point a more definite HCFC control plan may well be adopted.

The most significant measure was the inclusion of financial assistance to developing countries. The established fund will provide between \$160 - \$240 million over the next three years for this purpose. It will be administered under the guidance of the World Bank, the United Nations Environment Program, and the United Nations Development Program. The fund will be managed by an Executive Committee overseen by 14 of the Parties to the Protocol. The United States is one of those 14 countries, and has effectively been designated as a permanent member of the committee. I have been selected to represent the United States on the Executive Committee.

Subsequent EPA activities, will consist of monitoring the Senate's ratification of the amended Protocol, proposing regulations to implement the new measures, and coordinating these efforts with regulations required to implement the Clean Air Act (CAA) amendments when they are passed. In addition, the Executive Committee will meet to set-up and begin implementing the fund and we will be playing a key role in this process. A draft copy of the amended/adjusted Protocol, and decisions and resolutions adopted at the London meeting are enclosed.

CAA Conference

The House and Senate CAA Conferees are busy finalizing the atmospheric ozone provisions that will be part of the new CAA.

EXHIBIT

The Administration has made efforts to ensure consistency between the Act and the Protocol.

Next FACA Meeting

I would like to hold our next meeting in late September. By then we may have a better idea of the exact requirements in the CAA. I will contact you with a specific date for the meeting with as much advance notice as possible. The main focus of our efforts over the next year will be on implementing the CAA and the multilateral fund. I hope that the Advisory Council will play a significant role in these implementation efforts and I would like to discuss, at the next meeting, the best way to structure this effort.

Please let me know if you have any thoughts on the matter, and whether you would like to be included on the agenda, prior to our next meeting.

I hope your summer is enjoyable and look forward to seeing you in September.

Attachments: Summary of London Meeting
Draft Reports from London Meeting

EXHIBIT

To request the Secretariat to publish in its annual report on data an updated list of developing countries which, on the basis of complete data submissions, are considered to be operating under paragraph 1 of Article 5. The Secretariat shall also publish a list of developing countries that, having submitted incomplete or estimated data, appear to qualify as Parties operating under paragraph 1 of Article 5. In accordance with the provisions of Article 5 of the Protocol, no Party will be eligible for Paragraph 1 of Article 5 treatment until it submits complete data to the Secretariat establishing that its annual calculated per capita level of consumption is below 0.3 kg;

Decision II/11. Destruction technologies

To establish an ad hoc technical advisory committee on destruction technologies and to appoint its Chairman, who shall appoint in consultation with the Secretariat up to nine other members on the basis of nomination by Parties. The members shall be experts on destruction technologies and selected with due reference to equitable geographical distribution;

The committee shall analyse destruction technologies and assess their efficiency and environmental acceptability and develop approval criteria and measurements. The committee shall report regularly to meetings of the Parties;

Decision II/12. Customs Co-operation Council

To agree with the recommendations adopted by the Customs Co-operation Council that all member administrations take actions to reflect the adopted subheading in their national statistical nomenclatures as soon as possible, and to ask the Secretariat to inform the Council that the Parties, having determined that additional subheadings for individual chemicals controlled by the Montreal Protocol would be useful in their efforts to protect the ozone layer, request the assistance of the Council in this regard;

Decision II/13. Assessment panels

To request the Technology Review Panel to assess, in accordance with Article 6, the earliest technically feasible dates and the costs for reductions and total phase-out of 1,1,1-trichloroethane (methyl chloroform) and to report its findings in time for consideration by the preparatory meeting to the Fourth Meeting of the Parties with a view to their consideration at that Fourth Meeting;

To request the Secretariat to convene members of each of the four assessment panels established by the First Meeting of Parties to review new information and to consider its inclusion in supplementary reports in time for consideration by the Fourth Meeting of the Parties, subject to a review of their mandate in the context of Article 2, paragraph 9, at the Third Meeting of the Parties;

To request the Technology Review Panel to include in its work:

- (a) An evaluation of the need for transitional substances in specific applications; and
- (b) An analysis of the quantity of controlled substances required by Parties operating under paragraph 1 of Article 5 for their basic domestic needs, both at present and in the future, and the likely availability of such supplies; and
- (c) A comparison of the toxicity, flammability, energy efficiency implications and other environmental and safety considerations of chemical substitutes, along with an analysis of the likely availability of substitutes for medical uses;

To request the Scientific Assessment Panel, to include in its work:

- (a) An evaluation of the ozone depletion potential, other possible ozone layer impacts, and global warming potential of chemical substitutes (e.g. HCFCs and HFCs) for controlled substances;
- (b) An evaluation of the likely ozone depletion potential of "other halons" that might be produced in significant quantities; and
- (c) An analysis of the anticipated impact on the ozone layer of the revised control measures reflecting the changes adopted at the Second Meeting of the Parties taking into account the current level of global participation in the Protocol;

To instruct the Scientific Assessment Panel to prepare estimated data on the impacts on the ozone layer of engine emissions from high-altitude aircraft, heavy rockets and space shuttles;

To undertake efforts to encourage broad participation in all assessment panels by experts from developing countries;

Decision II/14. Workshops required by Articles 9 and 10 of the Protocol

To request the Executive Committee under the Financial Mechanism and the Secretariat to take into account in their work the recommendations on workplans required by Article 9 and Article 10 of the Protocol, as adopted by the third session of the first meeting of the Open-Ended Working Group of the Parties to the Protocol;

Decision II/15. Extension of the mandate of the Open-Ended Working Group of the Parties

To continue the work of the Open-Ended Working Group of the Parties and to extend its mandate to consider, if necessary and in particular, the following topics:

EXHIBIT

THE GAZETTE, MONTREAL, TUESDAY, JULY 31, 1990

5 A 7

Space exploration poisons environment law professor says

An international convention is urgently needed to stop the growing environmental degradation caused by space exploration, a Montreal law professor said yesterday.

Activities in space are "fraught with dangers resulting from the gradual pollution of the environment," said Nicolas Matte, director of McGill University's Centre for Research on Air and Space Law.

In a lecture to 134 students of the International Space University's summer class, Matte called for a global agreement to control space debris, chemical emissions from spacecraft and biological and radiological contamination in space.

Humanity, concerned with its survival, cannot afford to wait for a major catastrophe before it takes the initiative," he said.

The North American Aerospace Defence Command tracks more than 5,400 pieces of space waste, but there could be as many as eight times that number in orbit too small to be tracked, he said.

ORIGINAL PAGE IS
OF POOR QUALITY

NATIONAL NEWS

Rocket ignites; 1 missing, 2 hurt

By The Associated Press

EDWARDS AIR FORCE BASE, Calif. — A Titan 4 rocket booster motor erupted in flames at a test site Friday, injuring two people and leaving one missing while spewing a toxic cloud over the Mojave Desert, officials said.

A bottom section of a solid-fuel booster ignited when it was apparently dropped by a crane while being moved at the Air Force Astronautics Laboratory at Edwards Air Force Base, said Lt. Col. Jan Dalby.

"It actually started burning. We call it an ignition rather than

an explosion," Dalby said. "Rocket fuel burns very fast. It's hard to fight a fire with rocket fuel burning. It's best to just let it burn out."

Nearby test areas were evacuated and the injured were taken to the base hospital. The condition and identity of the injured wasn't known, but Dalby said of the missing man, "We assume he is dead."

By midafternoon, about 50 firefighters and Air Force security police worked in the area of the ferocious blaze. The Air Force sealed the area, saying it was too dangerous for civilians.

Desert residents saw a huge cloud pass and the California Highway Patrol closed California 58 through the region for a time after a warning by base officials.

The part of the rocket that ignited was the bottom segment of one of two solid-fueled boosters that would be strapped to the main Titan 4 liquid-fuel rocket. The main liquid-fueled section was not at the site.

The cloud contained hydrogen chloride, a poison, but no residents were evacuated, Kern County Fire Department Capt. Chris Angelo said. "It was high enough that we felt it wouldn't

come down," Angelo said.

There was no radiation hazard. The Titan 4, built by Martin Marietta Corp., is considered the Air Force's primary booster for launching heavy payloads into orbit. It is not used as a nuclear missile.

The second Titan 4, worth \$173 million, was launched June 8 from Cape Canaveral, Fla., carrying a secret surveillance satellite into orbit. The first was launched on June 14, 1989, boosting what analysts said was either a missile-warning satellite or an electronic eavesdropping satellite.

EXHIBIT

SA 15142 DOTY
The above are
Garden City, N.Y., December 1978.

THE OZONE WAR

LYDIA DOTTO and HAROLD SCHIFF

Chapter 6, pages 120-144 included with the letter but are not reproduced for this response due to potential copyright infringement.

DOUBLEDAY & COMPANY, INC.
GARDEN CITY, NEW YORK
1978

Letter Number 5

from
Dwight Bradshaw
Robert Esher
Citizens for a Healthy Environment
Waveland, MS

COMMENTS

Citizens for a Healthy Environment

P.O. Box 272
Waveland, Mississippi 39576
(601) 467-5936

1 October 1990

Dr. Rebecca McCaleb
NASA Environmental Officer
Code GAOO
Stennis Space Center, MS 39529-6000

Re: "Supplemental Final Environmental Impact Statement Space Shuttle Advanced Solid Rocket Motor Program" (SFEIS).

Dear Becky:

The SFEIS was a considerable improvement over the Final Environmental Impact Statement for the Space Shuttle Advanced Solid Rocket Motor Program (FEIS), but it falls short of doing an adequate job of addressing the real environmental and health concerns associated with testing solid rocket motors in south Mississippi. The SFEIS has not convinced us that NASA fully appreciates or understands the consequences of releasing hundreds of tons of toxic substances into the environment surrounding Stennis Space Center (SSC). Furthermore, NASA seems to have ignored the fact that SSC is located in a sensitive ecosystem: a subtropical wetland that is heavily forested. Finally, NASA failed to consider that the population density in the counties surrounding SSC is 10-30 times that of Box Elder County, L.T. where the Redesigned Solid Rocket Boosters (RSRB) are currently tested.

It is evident from the FEIS that NASA is still trying to justify a politically mandated decision rather than evaluating the project in a fair and impartial manner. As such, the SFEIS, as was the FEIS, is biased, misleading, and non-factual. We are also disappointed that NASA failed to address most of the concerns that were presented in our 6 April 1990 letter. We would like to restate those observations:

1. In our 6 April 1990 letter to NASA we stated:

"It is our understanding that a supplement must be prepared in the same fashion, exclusive of scoping, as the draft and final EIS".

After reviewing the National Environmental Policy Act Regulations (NEPA) and consulting with the Council on Environmental Quality (CEQ), we find this statement to be accurate. "Final" documents are not subject to review; by misrepresenting the SFEIS as a "final" rather than "draft," NASA gave the impression that there was no need to comment on the document. Statements made by NASA officials (Sun Herald, 24 February 1990, encl.) and the letter included with the SFEIS (encl.) stating "All letters will be responded to on an individual basis," only served to reinforce the belief held by many that written comments sent to NASA would be of little value since they would not be incorporated into the supplement or circulated to the appropriate regulatory agencies. The public and regulatory agencies should have been informed that NASA had an agreement with the CEQ that they were, *de facto*, treating the SFEIS as a "draft" and they would send a compilation of all letters to all citizens and regulatory agencies. In light of this misunderstanding, we would appreciate having the following questions answered: (a) Why were we not given a draft supplement to the FEIS to review? (b) Who at NASA made the decision not to follow the law (NEPA regulations) by submitting a final and not a draft supplement

CHE-5
CHE-6

RESPONSES

- CHE-1 All environmental aspects of SSC were considered during analyses presented in the Space Shuttle Advanced Solid Rocket Motor Program Final Environmental Impact Statement (FEIS), March, 1989, and in the SFEIS.
- CHE-2 NASA is aware of the differences in population densities between the counties surrounding SSC and Box Elder County, Utah. The population characteristics in the vicinity of SSC were fully evaluated in the SFEIS.
- CHE-3 Both the FEIS and SFEIS evaluated the environmental impacts of ASRM testing without consideration of political issues. Only scientifically defensible criteria were used in the FEIS and SFEIS process. The document is factual and openly documents the basis for all conclusions reached. Further, all assumptions used are clearly stated in both documents.
- CHE-4 Your letter was thoroughly reviewed, and your environmental concerns were considered in finalizing the scope of the SFEIS. Many of the concerns expressed in your letter were previously covered in the FEIS and other NASA documents. References are provided in following responses as required.
- CHE-5 Alternative procedures were granted to NASA under Title 40 CFR, Section 1502.9(c)(4) of the CEQ Regulations. These procedures were made known to the public through NASA advertisements, press releases, and public meetings. Official notice of alternative procedures for this SFEIS was also published in the Federal Register, Vol. 55, No. 165, p. 34733.
- CHE-6 There was no decision not to follow NEPA regulations. All federal regulations were followed.
- CHE-7 The SFEIS was not published in final form to minimize public and agency criticism. NASA has openly welcomed all public and agency comments on the SFEIS. All comments and responses have been compiled in the Completion of Comment Letters and Responses to the Space Shuttle ASRM SFEIS which is available upon written request.

COMMENTS

RESPONSES

Citizens for a Healthy Environment Comments on SFEIS

CHE-6 **Cont.** for review? (c) Was this decision intentional? (d) Was it done to minimize public
CHE-7 and regulatory agency criticism of the document?

2. It appears that no one at NASA is accountable for the decision to test fire the ASRM at SSC. The question of "accountability" has been addressed by members of the Citizens for a Healthy Environment on a number of occasions and by the Mississippi Bureau of Pollution Control (MBPC) at least once. In our 6 April 1990, letter we requested that NASA identify the person or persons accountable for the decision:

"In light of safety concerns, environmental risks and minimal payload increases, we believe that the ASRM project cannot be justified. This belief is reinforced by the National Research Council and NASA's own Aerospace Safety Advisory Panel who have recommended that solid rocket boosters be replaced with safer, non-polluting motors. Therefore, for legal and historical purposes, the individuals within NASA who are responsible for the ASRM project should be identified. In addition, the person, or persons, who made the decision to test the ASRM at Stennis Space Center should be made public."

CHE-8 (a) Who is accountable for the decision to test fire the ASRM at SSC? (b) Will the
CHE-9 person who is accountable be present at the hearings that will be held by the MBPC for NASA's Prevention of Significant Deterioration (PSD) permit application?

CHE-10 3. NASA held public meetings on ASRM in Picayune, Bay St. Louis, and
CHE-11 Diamondhead, MS, and Slidell, LA, shortly after the SFEIS was released. (a) What was the purpose of these meetings? (b) Will transcripts of these meetings be made available to the public and regulatory agencies? (c) Is NASA going to address the verbal comments made at these hearings in the SFEIS or in the appendix that will be sent to all regulatory agencies and interested parties? (If NASA has no intention of answering the questions asked at the public hearings, they have again misled the public because many citizens believed that their questions and NASA's answers would be included in the SFEIS).

CHE-12 4. The SFEIS completely failed to address the issue of alternatives to the proposed
CHE-13 action. NEPA regulations require that alternatives, including a no action alternative to the proposed action, be examined. In our 6 April 1990 letter to NASA, the following argument was presented:

"It is our opinion that NASA did not honestly evaluate the alternatives that were available at the time that the EIS was prepared. As such, we strongly recommend that NASA examine the following:

(a) The use of alternative motors to replace the solid rocket boosters on the shuttle. (In the Final EIS for the ASRM, NASA only discussed alternative fuels that were available for the Solid Rocket Booster.) NASA should discuss, in detail, the reasons why solid rocket motors, which are

CHE-8 Richard H. Truly, as Associate Administrator for Space Flight, by signing the Record of Decision on April 17, 1989, is responsible for the siting of the ASRM testing at SSC.

CHE-9 The present Associate Administrator for Space Flight, William B. Lenoir, will not be at the hearing; however, A. J. Rogers, Jr., Director of Center Operations at SSC, who signed the Prevention of Significant Deterioration (PSD) Air Emissions Permit application, will be present at the hearing.

CHE-10 The purpose of the August public meetings was to present the information contained in the SFEIS and to respond to the questions on the material contained in the report. The meetings were conducted to promote an exchange of information.

CHE-11 A transcript of the Picayune meeting and voice recordings of the other meetings were made. These records are available through NASA's Freedom of Information Office.

CHE-12 Those questions not answered at the public meeting were subsequently answered in writing. The correspondence can be found in the Compilation of Comment Letters and Responses to the Space Shuttle ASRM SFEIS which is available upon written request.

CHE-13 All questions asked at the public meetings were answered. Those not verbally responded to were answered in writing.

CHE-14 The purpose of the SFEIS was stated in Section 1.0. The SFEIS addresses issues about which the public wanted more information than provided in the FEIS (NASA, 1989) and to revisit environmental issues where new information has been made available since publication of the FEIS. Alternatives to the proposed action are addressed in the FEIS and the SFEIS.

CHE-15 Alternative propellants were discussed in Section 2.2.1 of the FEIS.

COMMENTS

RESPONSES

Citizens for a Healthy Environment Comments on SFEIS

based on 1950's technology, were selected over other types of motors when there are clear advantages of liquid and hybrid motors over solid rocket boosters. The advantages and disadvantages of all propulsion systems, including those that are under development, should be evaluated. (It is our understanding that both liquid and hybrid motors are more powerful, safer and cleaner than the ASRM.)

(b) In the Final EIS for the ASRM, NASA only considered firing the ASRM horizontally; a man-made ramp of undetermined size, configuration and composition was to deflect the gases into the atmosphere. Other methods for testing the ASRM should be evaluated. At the minimum, NASA should discuss: (i) scrubbing the gases emitted during a static test firing, (ii) transporting the motor to an arid site via rail and/or barge and rail for testing, (iii) testing on a stationary (concrete) off-shore platform or island, or (iv) testing on a mobile platform ("ship or barge of sufficient size)."

We still believe that the above statements need to be addressed. Furthermore, we more convinced now than we were previously that reasonable alternatives to the proposed action are available. (The question of transporting the motors by rail to another site, b (ii) above, was not even discussed in the SFEIS and the statement that NASA could not build an off-shore platform which would support 3.5 million pounds of thrust is idiotic (see Space Markets 1/1989, p. 9, encl.) This belief has been reinforced by discussions with experts throughout the country and the examination of available literature. (The names, addresses, and phone numbers of these individuals will be provided to appropriate regulatory agencies upon request.) (a) Will NASA allow others to examine the data they base their conclusions on? (b) Would NASA discuss the options with others who have differing opinions on what is technically feasible?

5. The SFEIS failed to address the economic impact of the proposed action. In our 6 April 1990 letter to NASA we requested that NASA reexamine the issue of the economic impact of testing the ASRM at SSC in light of the following:

Discrepancies between the economic impact of the ASRM project which was presented in the Final EIS and subsequent reports (e.g. Campbell 1989) should be clarified. The economic analysis should be based on a realistic scenario and not one that is designed to justify the project. It is our belief that it is unreasonable to assume that NASA will be using solid rocket booster's on the shuttle for 30 years (as per the Final EIS). The American people are unlikely to tolerate the use of solid rocket boosters, that put tons of toxic pollutants into the atmosphere and destroy the ozone layer, when non-polluting propulsion systems are available or

CHE-16 Development of hybrid motor technology has not progressed sufficiently for viable consideration of replacing Shuttle solid rocket motors with hybrid motors. Therefore a comparison of the power, safety, and cleanliness of the ASRM with hybrid motors cannot be made. See Response CHE-15.

CHE-17 These issues were addressed in Section 2.0 of the FEIS and pages 4-20 through 4-24 of the SFEIS.

CHE-18 Alternative test facilities such as an off-shore platform were considered by NASA. As explained in the SFEIS, page 4-23, the purpose of testing is to conduct sensitive measurements of the motor's performance. These measurements are not possible on an offshore platform because of the high vibration.

CHE-19 A large part of the data used in formulating NASA's propulsion systems is competition sensitive information. All of the publicly available NASA documents can be obtained through the Freedom of Information Act.

CHE-20 Various independent oversight groups are chartered to review and critique NASA's decisions and direction on major projects. These groups include the Aerospace Safety Advisory Panel and the National Research Council. As part of the review/oversight process, these organizations make observations and recommendations and prepare reports for NASA management. In the early phases of the ASRM Project various alternatives were considered including liquid propulsion versus solid motors, horizontal versus vertical test-firing, test-site locations and water versus rail transport. All of these decisions were subject to review by the above mentioned oversight organizations, with their recommendations thoroughly reviewed by NASA management. Please refer to Sections 1.0 and 2.0 of the FEIS for a discussion of the ASRM procurement process and alternatives, respectively.

CHE-21 The differences in the economic impact estimates presented in the FEIS (NASA, 1989) and those in Campbell's 1989 report are due to several factors. First, the estimates presented in the FEIS are based on both manufacturing and testing at SSC, while the Campbell estimates address only testing. Second, Campbell's report was prepared several months after the FEIS and had the benefit of a more current workforce estimate. For example, the FEIS assumed a testing workforce of 150 persons per year, while Campbell assumed 200 persons per

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COMMENTS

Citizens for a Healthy Environment Comments on SFEIS

CHE-22

can be developed. (In order to continue to fly the shuttle, NASA will have to be exempted from Clean Air regulations if the bill currently being debated in Congress is passed.) Therefore, we suggest that NASA be more realistic in their estimate of the life of the project and include the cost of shut-down in all future economic impact analyses of the ASRM project. (The closing of the Mississippi Army Ammunition Plant can be used as a model for the economic cost to a community of a Federal project being terminated prematurely.) The supplement should contain an economic analysis, including shut-down costs, conducted for five, 10, and 15 year project life. (An analysis of the cost of converting the ASRM facilities to a liquid or hybrid motor testing and manufacturing site would also be appropriate).

CHE-23

CHE-24

The economic analysis should also take into account environmental and health costs associated with open-air testing and open-pit burning of waste propellant. It is our belief that there are hidden costs associated with these activities. Among these will be: (i) increased health care costs, (ii) loss in tourism associate with degradation in air quality, (iii) damage to personal property, (iv) loss of jobs due to existing businesses relocating elsewhere or the area being unattractive to new industries due to unacceptably high levels of pollution.

CHE-25

We know of at least one company (Hot Sticks Manufacturing Company, Waveland, MS) that has stated publicly that it will relocate to another area if ASRM testing commences. Other local business owners have expressed concerns about the economic impact of ASRM testing. Specifically, they worry about how the project will affect the tourist trade, which is the life blood for many small shop owners in the Bay St. Louis-Waveland, MS, area. The medical community in Hancock County, MS, is concerned about the effects of testing on the health of their patients and several have reservations about living downwind from SSC. (a) We request that NASA address these questions concerning the economic impact of the ASRM program.

CHE-26

6. All of the predicted impacts from testing of the ASRM at SSC depend on the height to which the exhaust plume rises after a test. If the entire exhaust plume reaches 13,000 feet, as predicted in the SFEIS, the ground level impact of tests should be insignificant. However, if the plume does not reach this high altitude because it fails to penetrate an inversion layer or because NASA's predictions are incorrect, the impact could be disastrous. Since all the arguments that NASA used in the SFEIS to show that testing the motors at SSC will be "safe" are based on non-verified models, it is worthwhile reiterating what we stated in our 6 April 1990 letter about NASA's models:

The plume dispersion models that NASA has used to

RESPONSES

year. Third, estimates of NASA's planned nonsalary expenditures, which had not been determined when the FEIS was written, were available when the Campbell report was prepared. The addition of those expenditures would increase the impact of the project. Finally, the procedure followed to calculate employment multipliers for the FEIS was slightly different than the procedure followed by Campbell. There are a number of methods commonly used in economic impact analysis, and each gives a slightly different estimate of income and/or employment impacts.

NASA intends to comply with all regulations implementing the Clean Air Act Amendments of 1990.

CHE-22

Campbell's 1989 economic analysis estimated project benefits both annually and for the planned 30-year life of the project. The annual estimate of benefits associated with project operation was 868 jobs with annual income of \$24.3 million (Campbell, 1989; Table 5.3). Campbell provides estimates of the project's economic impact for 1, 5, 10, 20, and 30 years of operation, including inflation (Campbell, 1989; Table 5.5). The total economic effect of the ASRM project net of inflation can be calculated by multiplying the annual figures by the number of years the project is assumed to be in operation. No further analysis appears necessary to estimate the economic effects of a shorter project life.

CHE-23

The FEIS states that "should the project be canceled, the overall effect on unemployment could be significant. . . . The overall net employment effect would be greater than if the project had never been started" (NASA, 1989; page 3-76). NASA does not believe that any further economic analysis is needed.

CHE-24

NASA does not agree with the commentator's premise that there would be any increased health cost, any change in tourism, or any personal property damage due to ASRM testing. NASA's position is amply supported by the analysis presented in the SFEIS. As a result of our public information meetings, we are aware that one or more business people are considering moving their place of business if ASRM testing proceeds at SSC. Any such moves, while unnecessary in NASA's viewpoint, would be a negative effect of ASRM testing. The magnitude of that effect cannot be estimated, because there is no basis on which to estimate how many, if any, business people would choose to relocate. While individuals are entitled to

arrive at their own conclusions, we hope that individuals will consider the information presented in the SPEIS that ASRM testing will not result in adverse health impacts or a loss to personal property.

CHE-25 In the Bay St. Louis public meeting concerning this SPEIS, the owner of the company expressed concern about the ASRM project and stated that he might leave if his fears were not alleviated. We hope that a number of his questions were addressed. This information is available through the Freedom of Information Act.

CHE-26 See responses CHE-21 through CHE-25.

CHE-27 An inversion is an atmospheric phenomenon in which the temperature of the air increases with height for a thin zone instead of decreasing with height. A very strong inversion may have temperature increases of 5 to 10°C in just a few thousand feet of elevation. However, since the exhaust plume is several thousand degrees warmer than the ambient air, even a very strong inversion could not stop the plume's buoyant rise.

CHE-28 The models used in the SPEIS have been carefully verified on standard emission sources as well as solid rocket motor tests. A discussion of the dispersion modeling was provided in Section 4.1 of the SPEIS.

COMMENTS

RESPONSES

Citizens for a Healthy Environment Comments on SFEIS

CHE-29 predict the atmospheric concentrations from a static test firing are totally inadequate. First, these models were designed for smokstack emissions and not for the instantaneous releases of enormous quantities of pollutants that occur during a rocket motor test firing. (It is our understanding that these models can only predict atmospheric concentrations for events that last for one hour or greater. Also, Gaussian dispersion algorithms must be based on a mean of ten or more events and are only valid for vertically uniform wind directions.) Second, data has not been made public which verifies the models. (Data from test conducted at high elevations and under arid or semi-arid conditions are not applicable to sites at sea level, such as Stennis Space Center or Kennedy Space Center, that have dense air and high absolute humidity.) Third, the design for the deflection ramp has not been made public. (As far as we know NASA has not determined the size shape or configuration of the deflection ramp, even though it is essential for having the gasses "punch" through the mixing layer.) Fourth, the atmospheric conditions under which MASA plans to test motors have not been described. Fifth, the exact time of testing have not been presented. Will NASA conduct tests during normal working hours or will they be performed at night or on weekends/holidays? Will tests be permitted at the height of bird migrations? Sixth, the emergency procedures planned for a static test firing were not presented in the Final EIS. (In the event that the cloud of toxic gases emitted during a test firing fails to rise to the extreme high altitudes predicted by the atmospheric dispersion models what are the contingency plans for evacuating the employees at Stennis Space Center, the citizens living in the communities down wind from the test and travelers along Interstate 10? Also, how much time would there be for an evacuation? What would be the fate of the exhaust gases in the event of a case rupture?

Some of these concerns have been addressed (third and fourth), while others became more relevant in light of the 7 September 1990 mishap that happened at Edwards Air Force Base, CA, when a Titan 4 motor segment was accidentally dropped. Upon impact, the bottom segment of a Titan 4 ignited, killing one worker and sending a toxic cloud over the Mojave Desert which forced the closure of California Hwy 58. The motor reportedly fell five feet. The propellant in the Titan 4 is the same as is proposed for the ASRM (HTPB). (a) In light of this disaster, how likely is it that a similar disaster will strike SSC? (b) Why did the toxic cloud fail to rise to 10,000+ feet as predicted for the ASRM by INPLUFF and PCAD (see section 5.6.2)? According to EPA, the Air Force has detected rainfall events of pH 1.0 and pH 2.0 (five and 10 km downwind from a Titan launch at Cape Canaveral, FL. The SFEIS

CHE-29 The atmospheric models used in the SFEIS were either designed specifically for rapid burning of solid propellant or were selected because of their ability to model this type of an event. Please refer to Section 4.1 of the SFEIS.

CHE-30 The dispersion model, INPUFF 2.3, was designed to handle instantaneous releases of any size. See Section 4.1 of SFEIS.

CHE-31 The models can predict ambient concentrations for instantaneous as well as long-term events. See Section 4.1 of SFEIS.

CHE-32 Gaussian dispersion models will GYAK predict ambient concentrations if the wind direction varies with height. Thus, the model used projects higher concentrations than would be expected.

CHE-33 Data validating Gaussian dispersion models are available to the public through EPA.

CHE-34 The laws of physics incorporated into the models apply to SSC as well as to Utah. Atmospheric models are valid for both sites. See Appendix E of the SFEIS for an explanation of how high humidity affects the exhaust plume.

CHE-35 The design concept with overall dimension, configuration, and surface materials description have been made public through the Prevention of Significant Deterioration Air Emissions Permit Application to the Mississippi Department of Environmental Quality.

CHE-36 The deflection ramp is not essential to the vertical rise of the plume. Thermal buoyancy alone allows the plume to rise to high elevations. Complete discussions of modeling and plume rise behavior can be found in Sections 4.1.2 and 4.1.3 and Appendix E of the SFEIS.

CHE-37 Atmospheric testing conditions are described in Section 4.1.4 of the SFEIS under Case 1. Further refinement of these conditions will be presented in the PSD permit.

CHE-38 The testing time will be determined for each test individually and will depend upon such factors as the weather envelope (see p. 4-23 of the SFEIS). Testing is not planned for the night. Any restrictions on test times will be presented in the PSD permit.

CHE-39

This was discussed in the FEIS in Section 3.2.15. Furthermore, specific details will appear in a NASA prepared Public Notification and Emergency Response Plan to be submitted to the Mississippi Department of Environmental Quality prior to the first test. The plan will be implemented if the plume rise deviates such that projected ground level measurements violate ambient air quality standards. The plan will also be available to the public and will also be given to local appropriate emergency planning committee(s).

CHE-40

The Titan 4 segment fell approximately 70 feet. California Highway 58 was temporarily closed as a precautionary measure. The plume from the burning segment rose to approximately 12,800 feet. According to the U.S. Air Force, the dispersing cloud's constituents did not pose a significant hazard to laboratory employees or residents of surrounding communities.

CHE-41

ASRMs will be tested in a horizontal position and not subjected to high lifts, (unlike the vertical testing of the Titan 4 at Edwards Air Force Base) thus significantly minimizing accidental ignition by this means.

CHE-42

See answers CHE-40 and CHE-41.

CHE-43

There has been only one event as described (due to a Titan launch) in several decades of launching. This is further discussed in answer CHE-44.

COMMENTS

RESPONSES

Citizens for a Healthy Environment Comments on SFEIS

- CHE-43** predicts the maximum impact from an ASRM test to be a rainfall event of pH 2.8 (sect. 4.3; Table 4-8). (c) How can NASA resolve this discrepancy? (d) Under what conditions will PCAD predict a rainfall event of pH 1.0? pH 2.0? (e) Does NASA have any plans to evacuate employees at SSC, citizens living downwind from the test site, or travelers along Interstate 10 in the event that things did not go as planned? Would there be time for an evacuation? (f) With a height of 60 feet, the deflection ramp appears to be too small to do much good. It is our understanding, based on comments NASA officials made at the recent public hearings, that the exhaust stream from an ASRM test will go over the top of the ramp? (g) How will this affect plume rise? (h) Will the ramp cause the gases to mix with more ambient air and cool too quickly to rise to the predicted height? (i) How will the plan to gimbal the motor up to 8 degrees affect the height of the exhaust stream reacting the ramp? (k) What were the actual input parameters used for the calculation of the final plume rise height given in Table 4-1 of the SFEIS? Please give the vertical potential temperature gradient and how it was calculated, the effective heat release rate, the burn radius, the ambient air density, the specific heat of air, the ambient air temperature, and the entrainment coefficient that were used to calculate the plume rise.
- CHE-44** There are no conditions under which a rainfall event of pH 1.0 or 2.0 would occur from an ASRM test. The Case 2 rain pH calculated in the SFEIS assumes 100 percent fallout of the HCl in the exhaust plume. Additionally, it assumes enough rain falls to significantly affect the surface waters and soils in and around SSC. Based on these conditions, the average rain pH would be 2.8. A complete discussion of the impacts and calculations can be found in Section 4.3 and Appendix D of the SFEIS, respectively.
- CHE-45** The model PCAD does not predict acid rain events itself. However, the SFEIS (page 4-52) states that the rain pH may vary considerably in light rainfall immediately after the test. A small (light rain, lower pH) event would not affect surface waters and soils as much as a large event (heavy rain, pH 2.8) because not as much acid would be deposited. The Case 2 event is considered a severe acid rain event.
- CHE-46** See Anaver CHE-39. Plume rise measurements will be made immediately after each static test. Ample time should be available for notifications and emergency response, if necessary. These considerations will be built into the emergency response plan.
- CHE-47** The deflection ramp has been engineered to deflect all of the exhaust gases and particles. No part of the exhaust stream would pass unaffected over the ramp.
- CHE-48** Gases going over the top will be redirected upward by the resulting turbulent forces created by impingement of the majority of the plume.
- CHE-49** The deflection ramp will not affect the final plume rise elevation. The ramp will not significantly affect the entrainment of ambient air. Dispersion modeling and plume behavior principles are discussed in Section 4.1 and Appendix E of the SFEIS.
- CHE-50** The design of the ramp already accounts for the gimballing or rotation of the motor nozzle.
- CHE-51** All modeling inputs are presented in either Section 4.1.2 and Appendix E of the SFEIS or the PSD permit application. Both documents contain the same modeling.
- CHE-52** The predicted plume rise height given in the SFEIS is based strictly on data specific to SSC and the ASRM; no based strictly on data specific to SSC and the ASRM; no
- CHE-52** The predicted plume rise height given in the SFEIS is based strictly on data specific to SSC and the ASRM; no
- CHE-53** Conditions at SSC differ greatly from those in Utah. SSC is located in the coastal plain of Mississippi only 15 miles from Lake Borgne and the Mississippi Sound and 15 miles from Lake Pontchartrain. The site is essentially located in a wetland, the elevation is approximately 25 feet above sea level, the atmosphere in the area is unstable, daytime inversions are common, and there are no 1,000 foot high hills to create updrafts. Due to the extreme differences in atmospheric conditions between the Utah site and SSC, static test firings in Utah should not be used as a basis to predict the fallout from tests in Mississippi.
- CHE-54** However, Kennedy Space Center (KSC) is similar in many respects to SSC. During launches of the space shuttle at KSC, the ground cloud and the column cloud produced are usually captured by the inversion layer. The column cloud emitted just below the inversion layer is as hot, if not hotter, than the exhaust plume from a test. This indicates that there is a significant probability of the capture of the exhaust plume by an inversion.
- CHE-55** If the exhaust plume, or a substantial portion of it, is trapped below an inversion, the ground level concentrations of toxic chemicals will be thousands of times greater than the amounts predicted in the SFEIS. For example, in the FEIS the radius of the cloud at stabilization is given as one half of the plume rise height and the quantity of hydrogen chloride (HCl) produced per test as 103,596 kg. Therefore, if the plume rise height is 4,000 meters (13,123 feet), the initial concentration of HCl in the cloud will be 3.09 mg/m³. However, if the plume rises only to the inversion layer, typically

COMMENTS

Citizens for a Healthy Environment Comments on SPEIS

CHE-55
cont. at 1,000 meters (3,208 feet) the initial concentration of HCl will be 197.9 mg/m³ or approximately 165 parts per million (ppm). As there is little mixing through an inversion layer, the cloud would only disperse toward the ground and horizontally. This would result in ground level concentrations which would exceed public health standards by more than 1,000 times. (f) What would be the environmental and human health impact of a plume trapped below an inversion layer?

CHE-56 Appendix E of the SPEIS asserts that the dense, humid air at SSC will result in a higher plume rise than is observed at the Thiokol facility in Utah where the air is less dense and dryer. Either this assertion or the plume rise equation used in the PCAD model is incorrect. This can be shown merely by examining the plume rise equation used in the PCAD model.

$$\Delta h = \left[\frac{6 F_c}{U E^2 S} + \left[\frac{r}{E} \right]^3 \right]^{1/3} - \left[\frac{r}{E} \right]$$

where:

$$F_c = \frac{g Q_c}{\pi \sigma a C_p T_a}$$

g = gravitational acceleration (9.8 m/s²)

Q_c = effective heat release rate (cal/s)

σ = ambient air density (g/m²)

C_p = specific heat of air (cal/g °K)

T_a = ambient air temperature (°K)

E² = 0.5 (entrainment coefficient)

CHE-56
cont. As g and Q_c are constants, any increase in the ambient air density, the specific heat of air, and/or the ambient air temperature will result in a decrease in F_c and a decrease in the plume height. Air density is greater near sea level than at 4,500 feet above sea level as in Utah, the specific heat of air increases with the percentage of water in the air, i.e. humidity, and the average ambient air temperature is greater at SSC than at the Thiokol test facility. Therefore, according to the above equation, the exhaust plume cannot possibly rise as high at SSC as it does at the Thiokol facility. (m) Which is correct, the PCAD plume rise equation or Appendix E in the SPEIS?

CHE-57 High humidity will also likely reduce the plume rise due to the cooling of the exhaust. According to the FEIS and the SPEIS, approximately 80% of the initial plume is entrained air. As saturated air has a higher specific heat capacity than dry air, this will result in greater initial cooling of the plume. (n) Is this correct?

7. It is still unclear how NASA plans to dispose of bad motor segments and/or waste

RESPONSES

data from the Thiokol tests were used to predict the plume rise or ambient concentrations at SSC from ASRM testing.

CHE-53 We agree that SSC conditions differ from those in Utah. However, data from the Utah tests were used in evaluating the plume characteristics or impacts from ASRM testing at SSC.

CHE-54 Although SSC and KSC are similar in climate and elevation, the launch process is fundamentally different from a static test. Therefore, no comparison between the environmental effects at KSC and SSC can be made. A discussion of the differences of these two events was provided in Appendix E of the SPEIS.

CHE-55 The question does not apply to ASRM testing because the plume could not be trapped below an inversion layer at 3,208 feet. The launch process involves spraying millions of gallons of water on the launch pad which produces a mist. This process will not be used in ASRM testing. Additionally, the column cloud left by the ascending shuttle is spread out over 75 miles and can rapidly mix with ambient air and cool. The plume from a static test cannot cool as rapidly as a column cloud and therefore rises to higher elevations. Please refer to Appendix E of the SPEIS.

CHE-56 Both PCAD and the SPEIS are correct. The commentor misunderstands the information in Appendix E. The SPEIS does not deny the fact that the air is denser at the ground at SSC than at the ground at Thiokol, but illustrates that air density is not the dominant factor controlling plume rise. Appendix E states that the very humid air at SSC will cause water vapor in the plume to condense as the plume rises. The condensation of water vapor in the plume adds heat to the plume and allows it to rise higher than if the air were dry. Condensation of water vapor in the plume can dramatically increase the plume rise over the model predictions. Since the models do not account for this effect, the model probably underpredicted the final plume rise elevation.

CHE-57 We agree. However, the end result of humid air entrainment is to produce higher plume rises as explained in response CHE-56.

CHE-58 The SPEIS focused on the environmental impacts of ASRM testing at SSC. Since disposal of waste propellant will not occur at SSC, the issue was not addressed in the

COMMENTS

RESPONSES

Citizens for a Healthy Environment Comments on SFEIS

CHE-58 propellant. This issue was not adequately addressed in the FEIS and not even mentioned in the SFEIS. Our letter of 6 April 1990 requested that NASA examine this issue:

Environmentally acceptable methods for removing propellant from rejected or damaged motors or segments and for disposal of waste propellant should be presented. Simply firing unusable motors to remove the propellant, as is currently being done by Thiokol in Utah and the U. S. Army at Pueblo Colorado, is unacceptable. In addition, open air burning of waste propellant may not be permitted under new Clean Air legislation.

We went on to recommend that:

NASA should discuss alternative methods for dealing with bad motors or segments and disposing of waste propellant. Current options are discussed in Crochet et al. (1988). In addition, the U. S. Army Missile Command at Redstone Arsenal, has developed an innovative technique for removing ammonium perchlorate from solid rocket propellant using liquidified ammonia. The process termed "Critical Fluid Demilitarization Method for Composite Propellants" shows promise and should be investigated.

CHE-60 NASA should address these issues since the current "Best Available Control Technology" to dispose of bad motor segments and/or motors is to burn them intact Thiokol recently spent \$21-23,000,000 constructing an additional test stand to burn 15 solid rocket boosters with pre-Challenger type "O-rings and the Army burned a number of Pershing II missiles at Pueblo, Co. as part of the 1987 INF Treaty. Since it will not be possible to burn bad motor segments at the ASRM manufacturing facility NASA will need to find a suitable place. The only available site in Mississippi would be SSC. (a) Will NASA ever burn defective motor segments or motors containing bad segments at SSC? (b) If not, how will they remove the propellant? (c) Does the technology exist to remove propellant from defective or damaged motors the size of the ASRM? (d) If it does not exist, will it be developed before the ASRM goes into production? (e) Why has NASA applied for a permit to test four motors a year for 30 years when they have publicly stated that they will test 8 motors in the first two years of the program and only two a year thereafter?

CHE-61 8. SFEIS did a reasonably good job addressing the issue of the effect of testing on human health. The comments by all three reviewers were appreciated, but not too comforting. We believe that a number of glaring problems still exist in the discussion on health effects.

CHE-62 First, everything that is said about the levels of exposure is based on NASA's ability to predict (model) what the outcome of each test will be. This assumes that the PCAD and INPLUFF models are reliable and have been verified. (a) Have the models been verified under conditions found in south Mississippi? The probability of successfully predicting a rain event within two hours of a test is about 50 percent according to local weather forecasters. (b) What makes NASA think that it can

CHE-59 SFEIS. Waste propellant disposal alternatives were discussed in the FEIS. Rejected motor segments will be cleaned out at the Yellow Creek Production Facility and the contents disposed of according to permit conditions from the Mississippi Department of Environmental Quality.

CHE-60 The issue of waste propellant disposal and alternative technology development will be addressed in the Resource Conservation and Recovery Act Permit for the Yellow Creek Manufacturing Facility. Refer to response CHE-58.

CHE-61 The new static test stand at the Thiokol Facility in Utah was built to improve flight simulation forces on Shuttle solid rocket motors during static testing. This highly sophisticated test stand was not built to dispose of nonflight certifiable motors. NASA does not plan to static fire ASRM's for disposal purposes.

CHE-62 The current method for cleaning out a rejected ASRM segment that is being planned by Lockheed for the Yellow Creek Production Facility is a water "hog-out" process. The waste propellant will either be open burned or disposed of by an alternative method if available at Yellow Creek.

See CHE-61.

See CHE-61.

CHE-63 You have accurately described NASA's test plans. In the future, if any component or other unforeseen changes in the motor must be accommodated, further development testing must be performed. NASA's environmental analyses and permit requests are based on accommodating unforeseen problems. A maximum of four tests per year was used as the baseline for scoping all impacts, both short- and long-term, in the SFEIS.

CHE-64 The only aspect of the modeling that is affected by the climate at SSC is the plume rise modeling. As described in response CHE-56 and in the SFEIS, the conditions at SSC will likely produce higher plume rises than predicted by the PCAD model. See Appendix E of the SFEIS.

CHE-65 NASA will have far superior short-term forecasting abilities than the National Weather Service or local weather forecasters due to the collection of on-site upper air meteorological data. See Section 1.2 of the SFEIS.

COMMENTS

RESPONSES

Citizens for a Healthy Environment Comments on SFEIS

CHE-67 accurately predict the weather in south Mississippi when accurate weather prediction has eluded all others? (c) Considering the likelihood that the plume will fail to rise to the height predicted by PCAD and the probable capture of a significant portion of the plume by an inversion layer, what is the probability of a cloud exceeding public exposure limits reaching a populated area? (d) What is the probability of a lethal cloud from an ASRM test descending on a populated area? (e) What conditions would need to exist for this to occur?

CHE-68 Second, there appears to be considerable disagreement over the composition of the rocket exhaust. Nimmo et al. (1974) reported that better than 99 percent of the alumina emitted from solid rocket motors was in the gamma form which is soluble in mild acids. The SFEIS uses Cofer et al. (1984) to document that over 72 percent of the alumina generated during a shuttle launch was in the alpha form (p 4-30). (f) This discrepancy among the various research papers needs to be clarified. (Personal communications or NASA memos have no scientific validity and cannot be used to refute published accounts.) In any event, Cofer et al. (1984) qualified the results of their study by stating that the collection techniques were crude and strongly biased toward the collection of large particles. Since they found that formation of aluminum chlorides and/or oxychlorides occurred on the surface of alumina particles and it is known that surface area relative to volume increases as size decreases, one suspects that the values reported for soluble forms of aluminum would be minimum.

CHE-69 (g) Please comment on the formation of aluminum chlorides and/or oxychlorides on the surface of the airborne particles in the solid rocket exhaust. (NASA should consider the reactivity of monoatomic chlorine and diatomic chlorine in the formation of chlorides.) (h) Is there any published data based on actual samples taken in the laboratory and/or in the field (i.e. not generated from models, e.g. PCAD), on the amounts of these compounds or other soluble forms of aluminum released during solid rocket motor launches or test firings? In light of Dr. Perl's work and recent studies supporting his hypothesis that environmental factors contribute to some forms of Alzheimer's Disease, the solubility of aluminum compounds emitted from rocket exhaust should not be considered trivial. NASA needs to conduct further studies to identify all the products in solid rocket exhaust and not to rely on models (e.g. PCAD) or theoretical calculations to identify the products of combustion. (i) Is NASA conducting any ongoing studies that will actually measure the products of combustion from solid rocket motor launches or test firings? (j) If so, will the data from these studies be made available to the proper regulatory agencies and the public? (k) When?

CHE-70 Third, the SFEIS made no mention of the toxicity of aluminum hydroxide, chlorine, or carbon monoxide even though these are all components of solid rocket motor exhaust. (l) Why were these toxic compounds not discussed in the SFEIS? Over 100 tons of carbon monoxide are generated during a test firing. (m) Is all the carbon monoxide converted to carbon dioxide with afterburning or does some remain? (n) Would any carbon monoxide remain at ground levels? (Recent studies have shown that low levels of carbon monoxide are detrimental to patients with heart problems.) (o) What is the fate of the 15 tons of chlorine generated during a static test firing? (p) How much aluminum hydroxide is released during a test firing? (q) What is the toxicity of aluminum chloride if it is inhaled?

CHE-71 Fourth, inhalation studies performed by Stout et al. (1976) demonstrated that acid coated alumina particles, generated by burning solid rocket propellant, were an order of magnitude more toxic to mice than was HCl alone. Studies by Amdur and Chen (1989) and others have found similar effects with other acid coated particles. Therefore, NASA (or regulatory agencies) should carefully examine the role of

CHE-67 The plume physically cannot fail to rise to elevations that will result in anything but the ground-level air concentrations projected in the SFEIS, Section 4.2.1.

CHE-68 The meteorological conditions used in the SFEIS modeling produce the maximum ground-level concentrations of all the permitted conditions (see Section 4.2.1 of the SFEIS). For all permitted conditions, the plume will rise to elevations sufficiently high to allow adequate dispersion and ensure that ground-level concentrations do not exceed human health limits.

CHE-69 There is no probability of a lethal cloud from ASRM descending on a populated area.

CHE-70 There are no known meteorological conditions for SSC which would result in a lethal cloud from ASRM testing descending onto a populated area. Weather conditions for static testing will be restricted by the Mississippi Department of Environmental Quality to ensure protection of the public and environment.

CHE-71 Detailed examination of aluminum oxide particles from solid rocket motor exhaust during actual Space Shuttle launches (Cofer et al., 1984 and 1987) indicates that the aluminum oxide particles consist of both alpha and gamma crystalline phases with the majority in the alpha crystalline phase. Although the particle collection technique favored larger particles, small particles were collected and analyzed. Since the particles were examined individually, the sampling technique did not influence the results.

A preliminary study of solid rocket motor exhaust from Titan missiles (Nimmo et al., 1974) indicates that the aluminum oxide particles are predominately in the gamma crystalline phase. The authors, however, explicitly state that their research is preliminary and that conclusions at this time would be premature. Since the more recent work of Cofer et al. is much more carefully documented, is presented in professionally reviewed journals and presents evidence that contradicts the earlier study, we believe that the Cofer et al. papers are more accurate. A discussion of aluminum species resulting from ASRM static firing is provided in pages 4-29 through 4-33 of the SFEIS.

- CHE-72 The formation of aluminum chloride on aluminum oxide particles is discussed in the SFEIS. As stated previously, monatomic chlorine would react rapidly with other gases in the plume and would not remain as Cl. Very little Cl₂ would be available to react with particles. See response CHE-71.
- CHE-73 Exhaust from the ASRM is emitted at about 6,000°F and at a speed of Mach 8. These conditions make it impossible to quantitatively collect direct samples of the entire exhaust stream.
- CHE-74 Dr. Perl's studies as well as the studies of many other researchers in the field have been examined in relationship to ASRM tests and a full discussion is given in the SFEIS. NASA has identified all the products of combustion in the exhaust. Additionally, the PCAD model output has been verified with a chemical mass balance comparison with the ASRM fuel composition.
- CHE-75 See CHE-73.
- CHE-76 NASA will continue to further improve plume measurements at solid rocket motor tests at the Thiokol facilities in Utah as indicated in Section 1.2 of the SFEIS. Data to date is being compiled for a comprehensive report due out shortly. All data will be a matter of public record. Much of the data has already been provided to the Mississippi Department of Environmental Quality and directly to various private inquiries.
- CHE-77 Only those compounds that will be emitted in significant quantities and are of environmental or human health concern were re-examined in the SFEIS. Carbon monoxide is addressed in the PSD permit application. The ground-level concentration of CO from ASRM will be below all ambient standards for workers and the public. Information on CO was provided in Section 3.2.2 of the SFEIS.
- CHE-78 Some of the CO will likely remain unreacted for over an hour. However, the modeling presented in the PSD application assumes that all of the emitted CO will remain in the plume. Even with this conservative assumption, projected concentrations would be insignificant resulting in no potential for adverse health effects.
- CHE-79 See CHE-78.

CHE-80

Only 0.12 tons of chlorine gas (Cl_2) will be emitted. Most of the chlorine released in the plume would be in the form of HCl. Although Cl_2 is a stable molecule at high concentrations, sunlight tends to break the molecule down into $Cl\cdot$. $Cl\cdot$ is extremely reactive and will rapidly combine with other gases in the atmosphere (Finlayson-Pitts and Pitts, 1986). Therefore, the low concentrations of Cl_2 emitted in the plume will react with sunlight and other gases, effectively removing it from the atmosphere.

CHE-81

Aluminum hydroxide of the form $Al(OH)_3$ is not produced. Each test will produce 0.025 pounds of aluminum hydroxide of the form $AlOH$. A discussion of aluminum species relative to ASRM exhaust products was provided in response CHE-71.

CHE-82

Generally, the pulmonary effects of inhaled aluminum chloride are expected to be similar to that of HCl. Specific information regarding the pulmonary effects of inhaled aluminum chloride could not be found. It appears that its effect would be acute as a result of acid formation from hydrolysis of aluminum chloride (USEPA, 1987). Based on this, the American Conference of Governmental Industrial Hygienists and the Occupational Safety and Health Administration have derived an acceptable occupational exposure level of 2 mg/m³ for aluminum salts based on toxicity of hydrogen chloride (EPA, 1987). Therefore, following procedures, a comparison between the toxicity of aluminum chloride and HCl, adopted by EPA and OSHA, was conducted in the SFEIS. Since the expected concentration of aluminum chloride is approximately 4,000 times lower than HCl, no effects are expected. See Section 5.0 of the SFEIS.

COMMENTS

Citizens for a Healthy Environment Comments on SFEIS

CHE-83 synergism before any studies that will address the question of synergism? (r) Is
CHE-84 NASA conducting any studies that will address the question of synergism? (s) If not,
are they planning to study this issue? (t) When?

CHE-85 Fifth, I was told by a NASA official that NASA was planning to bring medical
researchers to SSC to answer questions on the health aspects of the ASRM program.
Dr. Bert Chevis, Chief of Staff, Hancock Medical Center, requested that his staff be
given the opportunity to discuss health issues with experts in inhalation toxicology and
Alzheimer's Disease. His request was denied. (u) Why?

9. The SFEIS completely overlooked the principal issues in the arguments that have
been made against testing ASRM in south Mississippi. The major issues raised by us
and others were that: (A) SSC is in an area that already has near toxic levels of
bioavailable aluminum in the soil and waterways; (B) the waters and soils in the
region are already acid; (C) the rainfall in the region is quite acid; (D) because SSC is
located in forested wetlands, most feeder roots are located at or near the surface (the
majority of the fine roots are within the top 1 inch, Esher *et al.* 1990); (E) chloride
ions are neither bound to clays nor metabolized by microbes; therefore, they are
always available to transport toxic metals to living organisms; (F) data on the toxicity
of HCl or bioavailable aluminum on living organisms, including immature forms, in
the region is almost non-existent; (G) toxicologists do not put much faith
in generalizations made about toxicity based on "extrapolations" from distantly related
species and/or different stages of an organism's life cycle; (H) SSC is located on the
Mississippi flyway, a major migratory route for birds; NASA has not considered what
effect an "invisible" toxic cloud will have on birds or, for that matter, bats (see CH2M
Hill 1987, p. 1-13); (I) the pine forests at SSC are extremely sensitive to acid input
(Esher 1990); (K) most, if not all, of the streams, whether they are intermittent or
permanent, support fish and other aquatic organisms; (L) NASA has never defined
what is meant by phrases such as "significant impact on the environment" or
"insignificant impact on the environment" or the terms "significant," "insignificant," or
"minor"; (L) NASA has not come-up with a workable mitigation plan for the 312
acres of wetlands that they will destroy nor have they addressed the fallout from the
rock tests in their 404 permit application. The following should be addressed
concerning the impact on wetlands and the mitigation plan:

CHE-97 (1) Testing the ASRM is not a water dependent project. Motor
segments can be transported by rail to non-wetland sites for testing.
The current shuttle booster segments (RSRB) are shipped by rail from
Brigham City, UT to Kennedy Space Center, FL. Although the ASRM
segments will be larger and heavier than the RSRB segments, there are
rail cars in service which can accommodate such loads. NASA has
publicly admitted, on at least two occasions, that the motors can be
transported by rail.

CHE-98 (2) NASA plans to destroy and/or fill 300-400 acres of forested
wetlands. The mitigation plan, or more correctly the lack of a plan to
compensate for wetlands loss, makes a mockery of President Bush's
pledge of "no net loss" of wetlands as well as Executive Order 11990.
The mitigation plan is ludicrous: Filling ditches in areas which are
already wetlands is not going to make new wetlands; new bottomland
hardwood forests are not created by "discontinuing pine plantation
management"; and pitcher plant communities are, in fact, enhanced by
pine plantation management (e.g. prescribed burns).

RESPONSES

CHE-83 The studies of Stout *et al.*, (1976) report a 10 fold
reduction in the LC_{50} (the concentration necessary to
kill 50 percent of the experimental animals) of HCl in
solid rocket motor exhaust over those of another research
group that used pure HCl (Higgins *et al.*, 1972). Stout
et al. inferred that this difference is due to a
synergistic interaction between HCl and aluminum oxide.
The apparent discrepancy in LC_{50} s could be the result of
variations in experimental protocols, differences in
sensitivities of the species used, and inherent
variability in experimental results. For example, Darmer
et al., (1974) reported mice LC_{50} s for HCl that are
higher than those of Stout *et al.* by factors ranging from
1.3 to 7.1. Furthermore, Stout *et al.* were unable to
actually measure the HCl concentrations. Results and
comparisons between laboratory results should be made
when more data are available using similar techniques.

CHE-84 NASA is not currently conducting studies to address
synergism. Although Amdur and Chen (1989) demonstrated
synergism with ultrafine zinc oxide and sulfuric acid
(both are more toxic than aluminum oxide and HCl),
synergism or additivity have not been demonstrated to
occur with aluminum and HCl (Wohlhage *et al.*, 1975).
Consideration of the above information was given in the
Health Effects Section (Section 5.0) of the SFEIS.

CHE-85 No plans have been made as yet to conduct studies on
potential synergistic interactions between aluminum oxide
and HCl. Synergism has not been demonstrated to occur
with exposures to aluminum oxide and HCl (Wohlhage *et al.*,
1975), nor is it expected to occur with these
constituents. However, NASA will review any new research
investigating potential additive or synergistic
interactions between particulates and irritant gases and
will evaluate their application to ASRM emissions.

CHE-86 Dr. Kurland of the Mayo Clinic was scheduled to attend
the public meetings. However, Dr. Kurland had to cancel
at the last minute. He provided NASA with a videotaped
discussion of neurological diseases as they pertain to
ASRM testing at SSC.

CHE-87 Water samples collected in and around SSC do reveal
relatively high levels of total and dissolved aluminum.
However, concentration alone is not an indicator of
toxicity. Not all dissolved aluminum is expected to be
bioavailable; humic and fulvic acids present in surface
waters are expected to complex the majority of free

aluminum ions, resulting in low bioavailable aluminum concentrations. Evidence is supported by peer-reviewed literature and preliminary modeling efforts using the EPA-approved MINTEQ metal speciation model. There are no indications that native aquatic populations are adversely affected by present concentrations of aluminum. ASRM testing is not expected to appreciably change the naturally occurring concentrations of bioavailable aluminum in the surface waters of SSC or surrounding areas. Complete discussions of this subject was provided in Sections 4.2.2 and 4.2.3 of the SPEIS.

CHE-87

True. Acidic waters and soils are found in much of the southeastern U.S., including the SSC area. Buffering capacity appears adequate in all but the smallest, most acidic puddles. ASRM testing is not expected to increase the acidity of surface waters to any measurable degree. That is, changes in pH of surface waters should not be detectable following ASRM testing. The only exception to this expectation is in small, shallow rainpools that are temporary. The pH depression in these pools is expected to be transient, but may adversely affect individual organisms. No adverse effects to aquatic populations are expected under any condition, however. This exception requires testing during or within 2 hours of a rain event, which is highly unlikely. See Sections 4.2.2 and 4.2.3 of the SPEIS.

CHE-88

True. Rainfall is quite acidic in this part of the country. Acid rain has been shown to result in adverse effects to aquatic organisms where surface water buffering capacity is limited, such as in the northeastern U.S. ASRM testing will not have the same effect at SSC because testing will not occur under weather conditions that would result in a rain event. Even if the unlikely, unexpected rain event would occur within two hours of testing, any acidic fallout would be buffered by natural buffering agents within native waters.

CHE-89

Comment noted.

CHE-90

True. Chloride is quite mobile in soils and water. Its ability to complex metals affects metal speciation and mobility. Complexation of metals with chloride increases metal solubility and decreases the tendency to form precipitates, resulting in increased potential toxicity. The chloride ion is not in itself considered toxic except at very high concentrations. Chloride is a common constituent of freshwater, seawater, rocks, soils, and

biological systems. Compared to naturally occurring chloride concentrations, ASRM testing is not expected to add sufficient additional chloride to result in increased mobility/solubility of metals.

CHE-91

Although there is not a large site- or species-specific database for investigating the effects of acid and aluminum, the EPA recognizes the use of representative species. The national database of aquatic species tested applies to all surface waters of the nation. There is no evidence that SSC-area aquatic organisms are any less or more sensitive than representative species used to generate national criteria. To promulgate national criteria, EPA requires that a minimum number of species from several taxonomic groups be tested. These species are considered toxicologically representative of 95 percent of all species. This database commonly includes larval life stages of fish and invertebrates, thereby including the most sensitive life stages.

The EPA also recognizes that site-specific water quality criteria may be generated by state agencies under certain conditions, but does not recommend this practice. EPA considers it unnecessary to test resident species since standard test species have been shown to represent the sensitive range of all ecosystems analyzed. Therefore, site-specific testing is unnecessary. Please review Section 4.2.3 of the SFEIS for details on the above information.

CHE-92

True. Taxonomically distant organisms may have quite different toxicologically responses to the same toxicant. Extrapolations are commonly made between taxonomically related species because they generally behave in a toxicologically similar manner. It is also true that immature life stages are generally the most sensitive life stages tested, and toxic concentrations/effects to adult organisms are often dissimilar to those of immature (more sensitive) organisms.

CHE-93

Since the duration of a test is very short, and the frequency of the tests is very low, the probability of bird kills by direct contact with the plume is minimal. During the plume's ascent to high altitudes, the plume is opaque. The plume becomes invisible after significant dispersion at high altitudes. Additionally, since the tests will occur during daytime hours, the potential for plume contact with bats is very small. A discussion is projected impacts on wildlife and domestic animals is provided in Section 4.2.6 of the SFEIS.

CHE-94

The study by Esler et al., 1990, demonstrates that pine trees are sensitive to frequent acid inputs over a prolonged period of time. This study is not applicable to ASRM testing because testing will occur infrequently (no more frequent than every 3 months) and testing will be conducted during no-rain periods. Therefore, ASRM testing cannot produce the acid inputs into the pine forests around SSC that would adversely impact the trees.

CHE-95

We agree that most streams in the area support fish and other aquatic organisms. Water bodies classified as streams are not expected to be affected by any products resulting from ASRM testing. Even in the unlikely event of test firing during rain, these water bodies have sufficient buffering capacity and volume to neutralize maximum predicted acidic inputs. Discussion of this subject was provided in Sections 4.2.3 and 4.3.3 of the SFEIS.

Intermittent streams, as well as intermittent static water bodies, such as rain pools or puddles, have increased potential for risk due to low volumes and potentially limited buffering capacities. We also agree that these intermittent or small, shallow water bodies are supportive of some types of aquatic life. Strictly aquatic organisms such as fish are not expected to survive in intermittent streams for obvious reasons. However, other vertebrates, such as toads or salamanders, may utilize these water bodies. Additionally, fungi, bacteria, protozoans, and possibly some invertebrates will most likely be represented in nearly every puddle or small pond.

The water qualities of several small water bodies in and around SSC were measured. These data indicate that the smallest water bodies that would be most at risk from acidic inputs may not support great numbers or diversity of invertebrates or vertebrates due to low pH, low dissolved oxygen, and high turbidity levels. Even though some vertebrates, such as toads, commonly lay eggs in intermittent puddles, they would not utilize those water bodies with poor water quality to the same extent as those with high pH and dissolved oxygen levels. As stated previously, bacteria, fungi, and some invertebrates most likely inhabit even these marginal water bodies; therefore, these organisms may be at risk due to acidic inputs.

CHE-96

The terms "significant," "insignificant," and so on are defined in the FEIS, Section 1.6.2 and Appendix G (NASA, 1989). In general, significance is defined in terms of established health of environmental standards or criteria. Environmental standards and criteria are referred to throughout the SFEIS.

CHE-97

Several railroad accidents involving ASRM segments have indicated that water transport should be safer and more efficient than rail transport. The size and weight of ASRM segments would dictate the need for special and costly heavy duty railcars and transportation over selected railroads and bridges capable of handling the load. These factors led to the conclusion that rail transport was impractical and that water was the method of choice. Transportation alternatives were subjects in the FEIS.

CHE-98

NASA plans to fill 69 acres of wetlands. This is the smallest possible impact given the constraints of the ASRM project, and was arrived at by repeated site selection refinements and redesign/modification of the ASRM facilities. This process is described in NASA's conceptual wetland mitigation plan (Appendix A of the SFEIS) submitted with the Section 404 permit application (NASA, 1990). An additional 243 acres would be cleared of cultivated pine and be allowed to revert to scrub-shrub wetland and grass-dominated persistent emergent wetland communities.

President Bush's pledge of "no overall net loss" of wetland functions, as well as Executive Order 11990 (which requires that no federal project be located within wetlands if practical alternatives exist that avoid wetlands) have been and are being considered in the siting and design of the ASRM project. However, in 1989, the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency--the two federal agencies that regulate the filling of wetlands--reached an agreement concluding that it may not be possible to completely avoid impacts to wetlands in areas with a high proportion of wetlands, such as much of Alaska and the Gulf Coastal Plain in Mississippi and Louisiana (ACOE, 1989). This agreement indicates that for these areas, the goal should be to minimize impacts and/or compensate for loss of wetland functions, rather than to avoid wetlands.

As explained in NASA's conceptual wetland mitigation plan (Appendix A of the SFEIS) submitted to the U.S. Army Corps of Engineers (ACE), NASA has already made efforts to avoid and minimize impacts, has committed to rehabilitating and restoring disturbed wetland environments that are not filled, and has committed to compensating for loss of wetland functions caused by the filling of 69 acres. Compensation will be by enhancing the existing degraded wetlands onsite. Enhancement of degraded wetlands to increase their functional capacity (as for wildlife habitat) is an acceptable means of compensation specifically mentioned in the Memorandum of Agreement (AOE, 1989). Whereas the wetland mitigation plan submitted with the Section 404 permit application was conceptual in nature, the final mitigation plan will include site-specific mitigative activities and the amount of wetland acreage to be enhanced. A final mitigation plan and the amount of acreage required for adequate compensation will be made a requirement of the Section 404 permit when it is issued by ACE, and will be based on requirements of ACE, U.S. Fish and Wildlife Service, and other agencies.

COMMENTS

Citizens for a Healthy Environment Comments on SFEIS

CHE-99

(3) The static test firing of the ASRM will discharge large amounts of toxic substances (e.g., aluminum compounds and hydrochloric acid) into the wetlands and waterways in and around Stennis Space Center. It is the opinion of the attorneys, including Federal lawyers, that we have talked with that the Clean Water Act requires that the deposition of toxic materials into wetlands must be considered in the permitting process.

(a) NASA should comment on 9 A-L.

CHE-100

10. There are several serious problems with the analysis of the environmental impact of a rain event shortly after a test in section 4.3 (Impacts Under Case 2 Conditions). Hydrogen chloride gas is extremely hygroscopic. It readily dissolves in water. The amount of HCl that will dissolve in rain is dependant on its concentration, the length of exposure, temperature, and the size of the rain drops. (a) Please comment.

CHE-101

In the FEIS the diameter of the exhaust plume was assumed to be 50 percent of the centerline stabilization altitude. In the SFEIS the diameter of the plume is assumed to be 75 percent of the centerline stabilization altitude and the claim is made that this is a more conservative estimate. However, this is not true when an unexpected rainfall event occurs. In this case, a smaller diameter exhaust plume will result in a lower pH rain. Thus, 0.75 inches of rain passing through a plume with a diameter of 10,038 feet (75 % of 13,380 feet) will have a pH of 1.7 while same amount of rain passing through an exhaust plume with a diameter of 6,690 feet (50 % of 13,380 feet) will have a pH of 1.3. These acid concentrations are much more likely than the rain-water pH given in Table 4-8 and agree with observations for rain events following Titan launches. The impact of such rain events on the environment should be included in the "Final" SFEIS. (b) Please comment.

CHE-102

Some very unrealistic estimates are used to describe Devil's Swamp and predict the impact of an acid rain event. This wetland is not 124 square kilometers in size. A more accurate approximation would be 62 square kilometers or about 16 square miles. Also, during most of the year, the average water depth in this area is considerably less than 6 inches, the depth claimed in the SFEIS. A conservative estimate of the average water depth in this swamp during most of the year would be less than one inch. The impact of a rain passing through an exhaust plume and falling in this swamp would be more severe than portrayed in the SFEIS and would result in a pH of under 2.0. This would certainly result in the death of almost all of the fish and aquatic invertebrates. The potential impact of a rain event should be re-evaluated using realistic areas and volumes of both the rain event and the area impacted. (c) Comments?

CHE-103

11. Although the SFEIS was generally well written there were some errors not found by the reviewers. (a) On the top of page 4-31 the statement "These data indicate high levels of aluminum under existing conditions, the mean dissolved concentration of aluminum at SSC, 0.48 mg/l, substantially exceeds the mean of U.S. surface waters, 0.74 mg/l (Bodek et al. 1988)" does not make sense and should be corrected. (b) Section 5-4 is incomplete. We would appreciate receiving a complete copy of this section to comment on. (c) Table 4-10 in the SFEIS is misleading and should be changed to give a more accurate comparison of relative emission rates.

CHE-105

The regional emissions occur continuously for 325,600 minutes per year, while the ASRM will be tested only 9 minutes per year. The following changes in Table 4-10 are recommended:

RESPONSES

CHE-99

The FEIS and SFEIS clearly demonstrate that ASRM testing will not discharge large amounts of any substance into wetlands and waterways. The ASRM tests will deposit very little material into wetlands or waterways in and around SSC. When the emitted material ultimately returns to the earth's surface, the concentrations will be so low that the depositions will be negligible.

CHE-100

The process by which HCl is dissolved in rainwater is described in the SFEIS (page 4-91). Since the HCl will first form cloud droplets and then coalesce into raindrops, the concentration of HCl in the rain will not be drop-size dependent.

CHE-101

HCl will not dissolve in rain by having raindrops fall through the exhaust plume. As described in the SFEIS, the HCl aerosols must first form cloud droplets and then form raindrops before falling as rain. These processes are extremely chaotic and turbulent and will tend to mix the HCl throughout the rain cloud. Therefore, it is the amount of rain that falls that determines the average concentration of the HCl in a rain immediately after testing, not the diameter of the plume. Given the conditions described in the SFEIS, the resulting rain pH would be 2.8. The fact that the commenter's calculations of rain pH agree with the measured rain pH from the Titan event in Florida is probably a coincidence. Since the HCl from a static test performed during or before a rain event would dissolve in the cloud droplets in the rain cloud before raining out, the rain pH must be calculated from the mass of HCl emitted, the area of the rain cloud, and the amount of rain that falls. Calculations of rainwater pH based on the plume diameter will generally give erroneous results.

CHE-102

Estimates of impact were not intended to be representative of any single SSC site but were intended to encompass parameters exhibited by the majority of water bodies in and around SSC. It was clearly stated in the SFEIS that the more shallow, smaller water bodies would be at most risk. Waters with characteristics of Devil's Swamp were used to represent major water bodies that may be at risk. Smaller puddles or rainpools would have increased risk compared to larger water bodies. If pH 2 water resulted from any source, most invertebrates and probably all vertebrates would not survive. It is not practical to evaluate all water bodies in the SSC area. We attempted to encompass most of the larger water bodies in our evaluation, and stated that, under the unlikely conditions of testing during a rain event, water

COMMENTS

Citizens for a Healthy Environment Comments on SFEIS

Annual emission rates of acid gases from the southeastern states of the United States.^{a)}

Compound	Annual Emission Rate (tons/year)	tons/minute
Regional SO ₂ b/	5,300,000	10.0
Regional NO _x b/	3,700,000	7.0
Regional HCl b/	151,000	0.3
ASRM HCl	508	56.4

a/ Southeastern states include Mississippi, Alabama, Georgia, Florida, Kentucky, North Carolina, South Carolina, and Tennessee.

b/ Source: NAPAP 1990

As can be seen from the above comparison, during each 2.25 minute test the ASRM will produce 188 times the HCl that is emitted in all the southeastern states combined. The HCl emissions from an ASRM test will be 325% greater than the total acid gas emissions for these states for the same period of time. The important issue here is concentration. All of this acid is emitted in one location and is highly concentrated, unlike the regional emissions which are dispersed over an eight state area.

12. In light of the serious errors in the SFEIS, the lack of a wetlands mitigation plan, and the comments made by Drs. Perl, Kurland, and Costa, we highly recommend that NASA consider publishing a "Final" SFEIS.

If you desire additional information or wish to discuss anything with us please feel free to phone. We can be reached, during normal working hours, at (801) 688-3227.

Sincerely,

Robert J. Eshe

Robert J. Eshe, Ph. D.
Reviewer

Dwight K Bradshaw
Dwight K Bradshaw
Reviewer

cc. Carl Bausch
William Reilly
Gerald Miller
Tom Thornhill
Charles Chisolm
Jerry Mitchell

RESPONSES

bodies that were more shallow, smaller, and with lower buffering capacity would be more at risk to acidic inputs. Risks could include death of organisms present if the pH dropped below lower limits acceptable for survival. The analysis performed in the SFEIS erred on the side of caution, i.e., was overly conservative.

CHE-103

The corrected sentence should read: "These data indicate high levels of Al under existing conditions; the mean total aluminum concentration in sampled waters at SSC, 1.3 mg/l, substantially exceeds the mean of U.S. surface waters, 0.74 mg/l (Bodek et al., 1988)."

CHE-104

Several words were left off the end of Section 5.4. The last sentence of Section 5.4 should read, "Nevertheless, to minimize public exposure, ASRM tests will be conducted only in meteorological conditions favorable for adequate dispersion."

CHE-105

We acknowledge that ASRM emissions, when expressed as tons/minute, are higher than power plant and industrial emissions as shown in the commentor's table. The SFEIS analysis of short-term effects was based on the estimated emissions occurring over an admittedly short period of time. In the same vein, the cumulative environmental analyses were based on the actual emissions during the period analyzed. Since the cumulative impacts discussed in Section 4.4 occur over many years, the data in Table 4-10 are presented in the most logical form (i.e., tons per year).

CHE-106

NASA does not agree that this or any other commentor has identified any "serious errors" in the SFEIS. Any questions raised by commentors on the SFEIS have been fully addressed. NASA has submitted a wetlands mitigative plan to the Corps of Engineers which will determine its adequacy. As noted on page 5-1 of the SFEIS, the comments of Dr. Perl, Dr. Kurland, and Dr. Costa were already incorporated into the document distributed for public comment.

COMMENTS

RESPONSES

Citizens for a Healthy Environment Comments on SFEIS

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- Esher, R. J. and D. K. Bradshaw. 1988. An ecological survey of the SSC area potentially impacted by an Advanced Solid Rocket Motor manufacturing and test facility. Final report submitted to National Aeronautics and Space Administration, John C. Stennis Space Center. iv + 49 + 14 pp.
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- Stout, J. J. D. R. Reynolds, D. W. Washington, H. O. Whittier and B. Madsen. 1976. Ecological effects and environmental fate of solid rocket exhaust. Final Report, NASA, Kennedy Space Center. 196 pp.

(Attachment from Mr. Robert J. Davis on Panther Sitings
was extracted from this letter for an individual
response as Letter Number 6.)

February 24, 1990

Solving the Mississippi Gulf Coast for 165 Years

Vol 106 No 147 25

EXHIBIT

THE SUN HERALD

ASRM is getting 2nd look

Agency cites wetlands impact in planning review of shuttle tests

By SHARON LEMER
STAFF WRITER

• STENNIS SPACE CENTER — NASA will take another look at the proposed test-firing of space shuttle rocket motors, the space agency announced Friday.

Depending on how far the review goes, it could conceivably alter how, when and where the agency tests the motors.

But it would be "premature to speculate" on any potential program changes, said Jack Rogers, Stennis Space Center operations director.

While two of the project's critics said they are elated with the decision, the review may not go as far as they had hoped.

The critics, Mississippi State University ecologist Dwight Bradshaw and Robert Estler, had made it known recently — through letters to federal and state agencies — that they planned to petition the agency to revamp an environmental impact statement, or EIS.

And they said they will still do so if concerns raised by the public aren't addressed.

Still, Bradshaw called the decision "a public victory." "No matter what they say, the real reason for them doing it is the public outcry" over the proposed testing, Bradshaw said.

But very few of the issues raised by the ecologists will be addressed in the agency's review, Rogers said. The agency will not hold a public hearing and will only address wetlands issues.

The tests, to begin in 1993, are to check the safety, reliability and performance of the advanced solid rocket motors — ASRM — which will be built in Yellow Creek, near Iuka.

Hundreds of Coast residents have voiced varying degrees of opposition to the proposed tests, each of which will spew about 350 tons of noisily toxic pollutants into the air. They are concerned about the potential harm the pollution could cause to human health and the

Please see ASRM, Back Page

EXHIBIT

ENVIRONMENTAL IMPACT STATEMENT

- ▶ **WHAT:** A set of procedures to help public officials make the best decisions about federal projects based on environmental concerns.
- ▶ **HOW:** By involving the public in decisions that affect the environment and to ensure that environmental information is available to public officials and citizens before decisions are made.
- ▶ **WHO:** Federal agencies are required — under the National Environmental Policy Act — to create an environmental impact statement when a proposed project could significantly impact the environment.
- ▶ **WHY:** To identify and study significant environmental issues and consider reasonable alternatives to minimize adverse effects.

ASRM

Continued from Page A-1

environment.

Rogers, however, said the decision was made strictly because the agency needs to study the impact the testing will have on wetlands. That is because the federal government broadened the definition of wetlands since the final environmental impact statement was issued in March 1989, Rogers said.

Under the new guidelines, there are about 200 acres of wetlands on which buildings would be constructed or excavation would take place, Rogers said.

The supplement to the EIS will "provide updated, site specific information addressing the effect of construction and the motor exhaust on wetlands, and how the agency plans to address the impact."

President Bush has called for a national "no net loss" of wetlands policy.

which could require anyone building on or filling in wetlands to minimize the impact and create or enhance wetlands elsewhere.

Rogers said a public hearing will not be held on the supplemental EIS, but that letters outlining concerns will be considered. The agency plans to begin the process in March 9 and publish the supplement by June.

Although Rogers said the decision was made strictly to clarify questions concerning wetlands, rocket motor project manager Lon Miller said public concerns in general will be considered.

He said the decision also was based on new information gleaned as contractors go to work on the project and NASA's decision to change the test stand site.

Miller said the process would allow the agency to "go to set the record straight" and address "misinformation" that has been passed along concerning the perceived dangers of the testing.

EXHIBIT

Space Administration

John C. Stennis Space Center
Stennis Space Center, MS 39529-6000



18 PART OF GA00

August 9, 1990

Dear Recipient:

We are pleased to provide you with a copy of the Supplemental Final Environmental Impact Statement on the Space Shuttle Advanced Solid Rocket Motor Program. The period of review on this document will extend for 45 days, beginning on or about August 17, 1990. NASA officials and key preparers of this document will meet the public to discuss this information at 7:00 p.m. each evening on the following dates and locations:

Monday	08/27/90	Cornerstone	Picayune, MS
Tuesday	08/28/90	Hancock County Civic Center	Bay St. Louis, MS
Wednesday	08/29/90	Quality Inn	Diamondhead, MS
Thursday	08/30/90	Ramada Inn	Slidell, LA

All correspondence concerning this document should be forwarded to:

National Aeronautics and Space Administration
Attn: GAO/Environmental Projects Officer
John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

All letters will be responded to on an individual basis.

Sincerely,

Rebecca C. McCaleb, Ph.D.
Environmental Projects Officer

Enclosure

EXHIBIT

The Choices for Congress

When there are two committees of both houses of Congress set down to the task of examining in detail the future space launch needs of the USA, they will not be able to complain about a lack of background information and guidance.

In the second half of last year, the Congressional Office of Technology Assessment (OTA) published not just one but two complementary studies on this subject: both under the project directorship of Richard DalBello.

"Launch Options for the Future" described as "batter's guide" the more exciting road since it is essentially future-oriented and describes a variety of potential new vehicles in considerable detail. All the same, the study is crucial in a market system technologies being developed in a market unrelated vacuum. It takes some pains to quantify both the development and operational costs of the various options, as precise as is possible in a no-risks-of-unknowns questionnaire, but also with some reference to a "populated level" of system use. Its appendix on Cost Estimation Methodology would repay close reading by all technology-conscious advocates of advanced new launch systems as ends in themselves.

What the study strives to drive home is the concept of "life-cycle costs" which include both operational development costs and recurrent operational costs plus an understanding of their interrelationship under varying economic conditions. For example, new technology development costs are penalized more in a high interest rate environment.

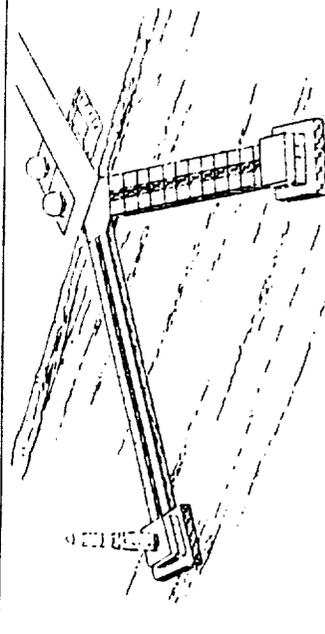
"Rebuilding Launch Operations Costs" is more strongly oriented towards launch operations analysis from payload preparation and integration through launching and mission operations to post-mission activities. It includes detailed - and sometimes crucial - descriptions of current US practices. However, the study also investigates possible future operations strategies. Here, the often conflicting requirements of ensuring cost reduction and increased reliability are discussed, if not in quite as much detail as one might have hoped.

...the message of the Launch Options study is that it is pointless trying to design the kind of new launch system without a clear idea of the total launch volume it will have to transport over a credible period of time (say, 20 years). Payloads can be divided between Commercial and Government (major military or civil). It is only over the latter that Congress and the incumbent administration can exercise direct control. It can be anticipated that commercial demand will be heavily dependent on the cost charged to users of whatever government developed launch vehicles and facilities may be made available.

As everyone has been saying for years, it is therefore up to the Executive and Legislative branches to get together to hammer out a coherent National Space Policy. Only the vaguest outlines of such a policy exist at present. It should take account of other claims on public spending, and of the evident need to reduce all such spending, not alternately increase revenues or both. Once formulated, a launch policy must be sustained in face of all but serious and unforeseeable fiscal catastrophes. Unless when this has been done, will it be possible to formulate any reliable estimate of long term future launch demand, and without this making plans to develop new launch systems that merely assume a need will emerge are essentially a waste of time.

The OTA Launch Options study stresses that with mainstreamization the US could double its means 1980-85 payload split of about 180 tonnes/year with its existing launch vehicles and facilities. "By improving existing vehicles and ground facilities and buying more launch vehicles, the United States could easily increase its launch capabilities to 1.4 million pounds (635t) to Low Earth Orbit per year. Such a launch program would support a space program with slow growth for many years."

These two booklets are sympathetically supportive of the excellent theoretical work being undertaken on new launch systems at present. But it is clear that they are not advising US lawmakers to invest too much money in them in the present absence of a clearcut need for such facilities.



Clean pad launch facility proposed for the US Air Force by VLS. The absence of an open launch area of entry is intended to provide a ready and minute reaction to the threat of a Soviet bomber. Proposal received at Santa Barbara with the assistance of a former member of the staff.

The collection review system is count for only 12% of the budget's flying seems to have disintegrated carrier; a winged flyback stage powered with 4th engines. Colburn is now critical of reliable elements which are so costly that they become more important than the itself.

Boeing proposal is likely to specify a 55' adjacent to the launch site, with the team being responsible for assembly, rig and payload integration. To avoid duplication of facilities at two launch sites Boeing narrowly proposing polar launchers; from several. Colburn notes that the in-flight safety and reliability promised by the design make the size of such polar launchers far less daunting.

General Dynamics' varied early proposals also included flyback boosters now seem concentrated on two identical cryogenic boosters in parallel. The booster stage engines, the core three of the same type engine-out capability is specified. The weight puts the same amount of payload through four more engines - burns out at 14000 lb after liftoff, and is jetisoned.

returbined engines would be used once the core stage no part of which is reusable of a second booster stage would increase payload capability to 250,000 lbs (113 tonnes) to make extensive use of built-in test and monitoring equipment to reduce processing workload. The expendable stage would be built in a highly-automated facility, with the minimum of time- or intensive operations. Savings of are foreseen in vehicle fabrication, in operations and 35-50% in actual cost. The company says that its VLS could be viable even at today's low launch either or not SLM proceeds.

Arthur Marrett and McDonnell Douglas' 2 proposal focuses on three concepts a broader range of technologies than two contenders. One blends a cryogenic stage with four to eight solid boosters (one in shows 11 boosters). The second of large number of liquid propellant boosters is emphasizing the cost and size advantages with LOX/hydrocarbon boosters. The third features liquid fueled boosters. The 200 proposal to return Phase 2. Arthur Marrett is concerned with McDonnell asking on the booster's payload cost and the operations plan.

ORIGINAL PAGE IS OF POOR QUALITY

Letter Numer 6

from
Robert J. Davis
Clermont Harbor, MS

COMMENTS

NASA
Attn: GA00
Environmental Projects Officer
Stennis Space Center, Ms 39529-6000

Robert J. Davis
P.O. Box 190
Clermont Harbor, Ms
39558

The following statement was read at the public meeting concerning the A.S.R.M. testing in Hancock county on the evening of 8/28/90 at the Hancock co. civic center.

"There is a very important issue that has not been discussed. My name is Bob Davis, I have a Bachelor's degree in animal Science. I've been a student of nature all of my life, and a professional taxidermist for over twenty years in three states. I have had my hands on living and dead cougars, both western cats and Florida panthers.

"I believe that the E. I. S. (concerning the A.S.R.M. tests) states that there are no endangered species on the test site... this is simply not true.

"Since 1968 there have been at least 43 credible accounts of Florida panther sightings in or near the test facility.

"In July 1975 at 0700 Hrs. B.E. Woverton, NASA's Environmental coordinator at the time, witnessed a Florida panther cross the road in front of his car. Before this he was very sceptical of all such encounters.

"In 1978, six workers were near building 3201 while they watched as a cat, "much longer than a bob-cat, and with a long tail," came out of the woods and went down to the main canal for a drink. The men watched for approximately 15 minutes at a distance of about 50yds.

"1983, Steven B. Sones a guard at the guard at the main test stand, watched as a small panther stalked a herd of deer for several minutes...the cat found out only at the last moment that there was a fence between he and his potential dinner.

"Reggie Pention, worker at the army ammunition plant was bow-hunting from a tree stand when he watched as a puma meandered passed him for four or five minutes and got within 18 or 19 yds. He was hunting near the test site.

RESPONSES

RJD-1

While the sightings of the Florida panther have been made, it is important to state that the areas within the ASRM test site may serve as critical habitat, but not breeding grounds. Give the range of the panther, it is not anticipated that the panther resides in the test site area. In addition, the Space Shuttle Advanced Solid Rocket Motor Program Final Environmental Impact Statement (FEIS), March, 1989, acknowledges that SSC contains suitable habitat for the Florida panther (*Felis concolor caryll*) and that the Mississippi Department of Wildlife Conservation (MDWC) has records of 15 confirmed sightings of this species over the past 30 years or so. As stated in Section 3.1.6 of the FEIS (NASA, 1989), the USFWS (1988) has no records which document the presence of any federally designated threatened or endangered species or critical habitat within the proposed ASRM test site or in the SSC fee area. However, the FEIS also states that NASA records indicate that the gopher tortoise (*Gopherus polyphemus*) and ringed saw-back turtle (*Graptemys scullifera*), both threatened species, have been observed on SSC, but not in or near the ASRM site.

In addition, many of the panther sightings have been documented since testing of the large Saturn engines in the 1960's during the Apollo Program. Evidence of these sightings support that the panther will not be affected by the noise from the ASRM testing.

RJD-1

COMMENTS

RESPONSES

"In the winter of 1986-87 a security guard at the army ammunition plant watched from his patrol car as a cat "about the size of a Doberman but lower to the ground and with a tail 1.5 to 2feet long". walked in a game-food plot. The animal was 15 yds. away for five minutes...so close that he could see the muscles rippling under the skin as the animal moved.

"In July, 1987 I personally was witness to a female of approximately 80 lbs. and one offspring approximately 25 lbs. with barely discernable spots. This to me was undeniable proof that, not only do these animals exist, but survive in a breeding population.

"The very nature of the test site and buffer-zone provides perhaps one of the last areas in which these magnificent animals can survive.

"Because no dead animals have been recovered NASA and others contend that they do not exist. This isn't proof that they do exist, merely a lack of physical evidence that they do.

"If I were not a witness, perhaps I would not be quite so concerned.

"These extremely elusive, intelligent, and beautiful animals hang onto existence by a very fragile thread. If NASA is permitted to test the solid rocket motors, it will most assuredly snap that precious thread.

"The Florida panther, Felis concolor coryi, is one of the most endangered species (sub-species) in North America."

Robert J. Davis

RJD-2

There have been a number of panther sightings on SSC over the last 30 years or so but the MDMC believes that most of these are of mountain lions. These two subspecies are difficult to distinguish, particularly when visibility is less than optimal. Since it is not uncommon for people to capture mountain lion cubs as pets and release them when they get too large, it is likely that this practice accounts for many of the sightings in or near SSC (personal communication K. Gordon, Biologist, MDMC, Jackson, MS, September 13, 1990). According to the MDMC, there are no Florida panthers in or near the SSC, although the habitat is suitable (personal communication K. Gordon, Biologist, MDMC, Jackson, MS, September 13, 1990).

The MDMC, in 1987, funded a track count survey specifically to determine the presence of panthers (Felis concolor subsp.) on SSC and the buffer area (McGinnis, 1988). No tracks were found during this survey. The report on the survey lists 43 records of panther sightings in Hancock County between 1958 and 1987, but references other studies that conclude that sightings should be de-emphasized as a basis for evaluating puma status, especially in the East, and should never be used to describe distribution or abundance (McGinnis, 1988). In addition, there seemed to be disproportionately few sightings of panthers in the buffer area, given the relative size of the area, compared to the SSC (McGinnis, 1988). Although the survey report did not conclude that panthers do not occur in Hancock County, it does state that SSC and the buffer area are not large enough to support a breeding population of panthers, although there is surrounding undeveloped land (McGinnis, 1988). Further, there is nothing in the analysis of the effects of the ASPM testing that suggests that any animals in or around SSC will be harmed in any way. NASA requested a further evaluation of this issue by the Mississippi Department of Wildlife, Fisheries and Parks. A copy of its response is attached.

RJD-2

COMMENTS

After the preceding statement was read, the following questions were asked of and answered by Dr. Rebecca McCaleb.

Q: "Did you (Dr. McCaleb) see one of these animals (Panther)?"

A: " Yes."

Q: "When did you see it?"

A: "1979."

Q: "Why has NASA not taken the testimony of many of its own scientists and employees and your own experience as evidence that the Florida panther does indeed exist on or near the test-site?"

A: "Because these animals have a very large range."

Q: "Since there are panthers on the test site, do you think that the ASRM testing should be permitted?"

A: "Yes, because the noise from tests of the large Saturn tests didn't scare them off, and the ASRM tests won't be any more noisy than those tests were."

RESPONSES

EXHIBIT

Search for Puma (Felis concolor subsp.) Tracks on City Roads
in the National Space Technology Laboratories and
Mississippi Army Ammunition Plant Sites and the Surrounding
Restrictive Easement Area in Hancock County, Mississippi

Final Report to the Mississippi Wildlife Heritage Fund

Helen J. McGinnis

May 5, 1968

This report was included with the letter, but is
not reproduced for this response due to potential
copyright infringement.

RESPONSE EXHIBIT



STATE OF MISSISSIPPI
Department of Wildlife,
Fisheries and Parks

RAY SHANE
Secretary

October 10, 1990

Dr. Rebecca C. McCaleb
NASA Code GA00
Stennis Space Center, MS 39529

RE: ASRM Assembly and Test Facilities

Dear Dr. McCaleb:

At the request of Ron Magee of your staff, I am enclosing a copy of the cover letter with which Jim Wiseman forwarded a printout from the Mississippi Natural Heritage Program database regarding the referenced facilities. I do not have a copy of the printout sent by Dr. Wiseman, the original and only copy being sent to Dr. McShane.

As stated by Dr. Wiseman, there is no hard scientific proof of the existence of this species in that area. Although there is a continuing history of sighting from in around the area over the last twenty or so years, these sightings do not constitute proof. Helen McGinnis, under contract to the Mississippi Wildlife Heritage Fund, conducted a track survey on MNTL between February and December 1987. She searched 135.4 miles of road and found no panther tracks although bobcat tracks in the area were found about once every five miles.

We have no explanation for the reported sighting on MNTL. The possibility exists that these are sightings of released or escaped mountain lions or possibly even Florida panthers.

Sincerely,

Kenneth L. Gordon, Coordinator
Mississippi Natural Heritage Program

RESPONSE EXHIBIT

Mississippi Department of Wildlife Conservation
Mississippi Museum of Natural Science
The Foye A. Cook Memorial
111 N. Jefferson Street
Jackson, MS 39202-2887
(601)354-7303

9 September 1988

M. Colleen McShane
EnviroSphere Company
10900 NE 8th Street
Bellevue, WA 98004-4405

RE: Rare, threatened and endangered species
Proposed ASRM assembly and test facilities

Dear Ms. McShane:

In response to your request for information dated 24 August, I have searched our database for occurrences of state or federal listed or proposed endangered, threatened, rare or otherwise significant animals and plants on the site referenced above. Enclosed are three printouts with information on occurrences of such species for (1) the Stennis Space Center, (2) the buffer zone around the Stennis Space Center, and (3) the Yellow Creek site.

You will note that some of the information is somewhat dated. In particular, the Stennis printout includes 15 occurrences of the Florida panther. Recent field studies indicate that the panther no longer occurs in the area. Also, most of the plant occurrences for the Yellow Creek site were discovered before the initial construction phases of the nuclear facility. The construction that did take place before the project was abandoned likely destroyed several of these occurrences. Additional field work would be needed to verify extant populations.

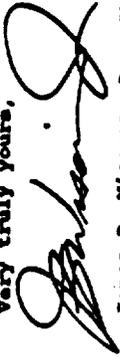
I have also enclosed complete lists of plants and animals monitored by MEMP along with an explanation of codes used. If you have any questions about any of this information, please do not hesitate to call me at (601)-354-7226. Also note our enclosed invoice for \$48.48.

The Mississippi Natural Heritage Program has compiled a database that is the most complete, single source of information about Mississippi's rare, threatened, endangered or otherwise significant plants, animals, plant communities and natural features. The quantity and quality of data collected by MEMP are dependent on the research and observations of many individuals and organizations. In many cases, this information is not the result of comprehensive or site-specific field surveys; most natural areas in Mississippi have not been thoroughly surveyed, and new occurrences of plant and animal species are constantly being discovered. Heritage reports summarize the existing

McShane, 9 September 1988, Page 2

Information known to MEMP at the time of the request and cannot always be considered a definitive statement on the presence, absence or condition of biological elements on a particular site. Please feel free to contact us if we can provide any additional information.

Very truly yours,



James B. Wiseman, Jr., Ph.D.
Community Ecologist/Data Specialist/Protection Planner
Mississippi Natural Heritage Program

JBW:oda

RAY MABUS
Governor
VERNON STEVENS
Executive Director
Commissioner
A. T. RAYBURN
Chairman
C. G. BARNETT
Member
M. J. HARRIS
Member
C. J. HARRIS
Member
L. H. HARRIS
Member
L. H. HARRIS
Member

Letter Number 7

from
Raymond A. Russell
Kiln, MS

COMMENTS

RESPONSES

NASA Environmental Officer
Code GACC

Stennis Space Center, MS 39529-2000

RAYMOND A. RUSSELL
P.O. BOX 107
NASA MSN
2000

After attending the August 25th meeting at the Hancock County Civic Center I feel that I am still bothered by many questions that the NASA panel left unanswered.

My chief concern is with the fallout of hydrochloric acid and aluminum oxide aerosols.

As a former Professor of Physiology, retired from the L.S.M.U. School of Medicine in New Orleans, I perhaps have a clearer notion than many of the potential hazards presented by these compounds. I am familiar with the literature on the inhalation of particulate alumina. I have seen the corrosive effect on skin and clothing of droplets of dilute hydrochloric acid. I have seen how quickly HCl will dissolve bone. I have inadvertently caught a tiny whiff of gaseous HCl while doing chemical syntheses. I have seen the effectiveness of "auriatic acid" in dissolving plaster and concrete. And I am deathly afraid of someone letting loose a giant cloud of those materials less than eight miles from my home (and even closer than that from the new public high school).

I do know that the STS was reported significant environmental damage as a result of some of the firings at Cape Kennedy. We know that automobiles parked near that facility must be protected from fallout during a launch. We have seen NASA's own video of a test-firing in Utah, where minutes after the main cloud had risen high into the sky there was still a lingering cloud of heavy vapors at ground level which showed no inclination to rise and dissipate.

In view of these actual observations, how can one credit a "computer model" which says that "no harm" would result from ASRM testing? Many a good theory has been destroyed by one ugly fact, and many a computer model has been undone by ignorance of one key detail in its programming. I suggest that some critical factor has been omitted in deriving the optimistic information provided by this simulation. Certainly it does not match up with many observed facts.

How do you explain the discrepancies? What does NASA's "computer simulation" tell them about the hydrogen leaks in the space shuttle launch system? or the bubble space telescope? or how many other recent fiascos? I'm sure all of these systems looked just peachy in computer simulation. I'm glad I didn't have to trust my life to them, but I am now being asked to do just that with the ASH computer simulation. Let's get real!

Please reconsider the decision to inflict this menace upon the hapless neighbors of the Stennis Space Facility.

Very truly yours,

Raymond A. Russell

Raymond A. Russell, P.O. 5.

RAR-1

NASA is well aware and extremely sensitive to the concerns you and other members of the public have expressed over the potential for adverse health effects. In no way would NASA deliberately undertake activities that would result in any significant adverse health effects to the residents in the vicinity of SSC. To support our analyses in the SPEIS, it is important to differentiate the emissions produced as a result of an ASRM static test and the health effects of "pure" hydrochloric acid. Additionally, we want to differentiate the effects that have occurred at KSC from Space Shuttle launches from the anticipated effects from ASRM testing at SSC. NASA does not agree that EPA has reported significant environmental damage at KSC. NASA agrees that localized fish kills and damage to vegetation around the pad occur with every launch and that low pH rain has occurred after one launch of a Titan at Cape Canaveral Air Force Station and one static test at the Aerojet Dade County Facility near Miami, Florida (Section 4.3.4 and Appendix E of the SPEIS). However, this does not constitute significant environmental damage because the effects are localized and temporary. No long-term or cumulative impacts have been reported for KSC.

RAR-2

ASRM testing at SSC will not include a water deluge system such as the one at KSC that is responsible for the near-field acid mist. Therefore, KSC impacts are not applicable to SSC.

RAR-3

Smoke can be emitted immediately after a test firing at Thiokol for two reasons. One potential cause of the smoke is burning plants (grass and sagebrush) adjacent to the flame zone. SSC's area downstream of the plume will be covered with concrete. The second cause is the burning of a small amount of insulation in the motor itself prior to cryogenic carbon dioxide quenching. Both the grass and insulation burn at a much lower temperature than the solid rocket fuel and the buoyancy of the emissions is much lower. The dark smoke does not rise rapidly with the major exhaust plume and sometimes appears to "linger" close to the ground. NASA understands how the visual image of a cloud of smoke "appears" to contradict claims that the plume dissipates.

RAR-4

NASA acknowledges the commentors concern over the use of computer models. We have therefore taken many steps to ensure the accuracy of the computer models used and to verify that key parameters have been input correctly. There were a number of checks by outside sources that the models were set up and run correctly. We have not taken computer models on face value. We have also validated the models to the observations of exhaust plumes from test firings at Thikol in Utah. The computer predictions appear to agree with those observations of ground level concentrations of exhaust products. Finally, NASA is committed to further verifying its modeling efforts throughout the ASRM test program (see Section 1.2 of the SPEIS). Air monitoring will be conducted prior and subsequent to planned tests. These measures will ensure that there are no drastic differences between the modeled predictive values and observed effects.

RAR-5

We understand and acknowledge your concerns about the ASRM static test program at SSC. SSC personnel will continue to study static tests in Utah and weather profiles and conditions at SSC over the next three years. Every effort will be made to safely conduct this activity at SSC under the scrutiny, restrictions, and requirements of the Mississippi Department of Environmental Quality and the environmental and safety consciousness of NASA management.

Letter Number 8

from
Kenneth W. Holt
Department of Health & Human Services
Atlanta, GA

COMMENTS

RESPONSES

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Center for Disease Control
Atlanta, GA 30333

September 27, 1990

National Aeronautics and Space Administration
Attn: GAO/Rebecca C. McCaleb, Ph.D.
Environmental Projects Officer
John C. Stennis Space Center
Stennis Space Center, Mississippi 39529-6000

Dear Dr. McCaleb:

In our letter of August 31, 1990, we indicated that another reviewer may wish to comment on the Supplemental Final Environmental Impact Statement (SFEIS) for the Space Shuttle Advance Rocket Motor Program. This letter incorporates those comments, and are provided on behalf of the U.S. Public Health Service.

The primary focus of this review has been on the air quality and dispersion modeling results that provide air concentrations and ground deposition rates of HCL, aluminum oxide and aluminum chloride from ASRM test emissions and the potential for these exhaust products to adversely affect the health of workers and the public. We feel that the area with the greatest amount of uncertainty has to do with the modeling of the exhaust plume. We do not object to the revised combination PCAD and INPUSS modeling approach used in this SFEIS and in the PSD permit as we have no better option to offer. However, we do feel that there is more than the normal uncertainty in this novel prediction method and that efforts to verify air quality predictions by evaluating the real time data from the testing at the Thiokol facility in Utah are very important. Similarly, an evaluation of predicted and actual plume behavior as a function of meteorological conditions during Stennis Space Center (SSC) testing is critical in validating this dispersion modeling approach.

One specific aspect of the modeling approach which needs to be verified is the State 2 PCAD Model Plume Elevation Subprogram which gives predicted plume altitudes based on thermal stabilization. These plume altitudes are considerably above normal mixing heights at SSC, and the argument that the larger vertical rise of the plume results in higher estimated ground level concentrations appears to be valid only if the plume actually exceeds the mixing height. Given the assumption that the plume does not rise above the mixing height, would predicted concentrations exceed air quality standards chosen as protective of health? If the predicted concentrations do not exceed these standards, then your argument that human health will be protected

DHHS-1

Comment noted. NASA intends to implement a monitoring program to evaluate predicted versus actual plume behavior. Please refer to Section 1.2 of the SFEIS.

DHHS-2

The modeling results presented in the SFEIS represent meteorological conditions which produce the highest ground-level concentrations of exhaust products. Since NASA will not test unless the meteorological conditions presented in the PSD permit application are met, the modeling results in the SFEIS represent "worst case" predictions.

The only conditions which could result in a plume rise below the mixing height are very high winds (gale force or higher). Very high winds might increase the entrainment of ambient air into the plume and cool it more rapidly than light winds. However, high winds would dramatically increase the dispersion of the plume, resulting in low ground-level concentrations. In any event, the modeling results in the SFEIS contain the highest possible ground-level concentrations for permissible test conditions.

DHHS-1

DHHS-2

COMMENTS

becomes very forceful. Use of this "worst case" condition may merit consideration.

DHHS-3 | If this worst case assumption results in predicted concentrations greater than those safe for human health, then two additional steps are indicated. They are (1) conduct further validation of the assumption and the model and (2) monitoring of air quality at the time of the first test.

Thank you for the opportunity to review and comment on this SFEIS. If you have any questions regarding these comments, feel free to call me at (404) 488-4595, FTS 236-4595.

Sincerely yours



Kenneth W. Holt, M.S.E.H.
Environmental Health Scientist
Center for Environmental Health
and Injury Control

RESPONSES

DHHS-3 | Ground-level concentrations are predicted to be below human-health standards during and following testing. NAGA will conduct air quality monitoring during all tests to verify that actual concentrations are as predicted and pose no threat to human health.

Letter Number 9

from
Edward G. McGregor
Army Corps of Engineers
Vicksburg, MS

COMMENTS

RESPONSES



DEPARTMENT OF THE ARMY
REGULAR DISTRICT CORPS OF ENGINEERS
ATTN: SAC
VICISBURG, MISSISSIPPI 39111-0000

September 24, 1990

68A710
ATTENTION OF

Operations Division
Regulatory

Rebecca McCaleb, Ph.D.
National Aeronautics and Space
Administration
ATTN: GAOO/Environmental Projects Officer
John C. Stennis Space Center
Stennis Space Center, Mississippi 39529-6000

Dear Dr. McCaleb:

We have reviewed your Supplemental Final Environmental Impact Statement (SFEIS) for the Space Shuttle Advanced Solid Rocket Motor Program. Our review of this document centers on the regulatory aspects of Section 404 of the Clean Water Act. However, other comments and observations as to other Federal mandates are provided for consideration. Our comments are provided below:

Page xii. - "First, in late March 1989, the U.S. Army Corps of Engineers and Environmental Protection Agency (EPA) agreed to use the same comprehensive procedures to identify and delineate wetlands." The Federal Manual for Identifying and Delineating Jurisdictional Wetlands is the comprehensive procedure used by Federal agencies to identify and delineate wetlands. It was agreed to by EPA, the U.S. Fish and Wildlife Service, the United States Department of Agriculture's Soil Conservation Service, and the Corps in January 1990. The manual was implemented by these agencies in March 1989.

Page xix. - "Wetlands temporarily affected by construction will be allowed to return to their natural state." We are not sure to which wetland areas this is referring. Is it referring to wetland areas adjacent to the proposed test site which will be cleared and not filled (24J acres, page xii) or to other wetland areas?

Page 2-11. - Paragraph 2.1 refers several times to the "Section 404 wetland permit." Section 404 requires Department of the Army authorization for discharges of dredged and/or fill material into waters of the United States, which includes wetlands. It would be more appropriate to refer to the "Section 404 permit." Additionally, the action agency

- DOA-1 NASA agrees with this clarifying statement.
- DOA-2 "Wetlands temporarily affected by construction will be allowed to return to their natural state." The wetlands referred to in this sentence are those 24J acres that will be cleared, but not filled, as part of the construction and operation of the ASRM test site facilities. These areas will be cleared for fire control and safety reasons with the intent that they be left to revegetate toward a natural nonforested condition. Such a natural condition would include areas of scrub-shrub wetland and grass-dominated persistent emergent wetland.
- DOA-3 NASA agrees with this clarifying statement.

DOA-1

DOA-2

DOA-3

COMMENTS

RESPONSES

- DOA-4** should address the "water dependency" or the lack thereof for the development of rocket testing and related facilities in waters of the United States including identified wetlands. The lack of upland site alternatives for the project should be discussed specifically. Refer also to paragraph 3.2.1., page 3-1.
- DOA-5** Page 2-1. - "In March 1989 (in compliance with the two agencies' coordination agreement) . . ." The referenced "coordination agreement" should be further identified. We suggest, " . . . (in compliance with the two agencies' 1980 Memorandum of Understanding which provided for EPA determination of wetland boundaries in "special case" areas, the ACOE referred the request for a jurisdictional determination to EPA since the location of the site (Hancock County, Mississippi) had been previously designated as a special case area by EPA. EPA conducted an investigation of the proposed ASRM test site to determine the size and extent of existing wetlands." It is not clear to us whether or not EPA used the new wetlands delineation method to make the wetland call.
- DOA-6** Page 1-1. - "Because of the large amount of proposed wetlands in the project vicinity . . ." We suggest the word "proposed" be deleted. Wetland areas within the project vicinity have been delineated. They are not "proposed".
- DOA-7** - Pine-savannah rather than pine forest or pine plantation most appropriately describes the project area. As you have noted, the site has been managed as a commercial pine plantation forest. However, as you have also stated, " . . . despite many decades of vegetation conversion to pine plantation as a result of silvicultural (timber growing) practices, wetland vegetation (bottomland hardwood species) is still an abundant element in pine forest understories and in forest openings (pitcher plant bogs)." If pine forest and/or pine plantation are used, they should be defined and specific areas identified.
- DOA-8** Page 1-6. - It is confusing to say that BLH-WET provides "an estimate" of the value of the wetland. BLH-WET gives a probability (high, medium, or low) that a wetland performs a specific function.
- DOA-9** Page 1-2. - The filling of wetlands is not regulated under Section 10 of the Rivers and Harbors Act. A Section 10 permit is required for work conducted within the ordinary

- DOA-4** Potential, dependable rail movement of the significantly larger ASRM segments over the current space shuttle solid rocket motors (SRM) is doubtful. The record of impacts to NASA rail containers with SRM segments is high. The static test stand and support infrastructure at SSC cannot avoid wetlands due to their predominance. NASA has made every effort to minimize physical and functional loss of wetlands and prepare a sound mitigation approach for compensation of the losses. Static test sites and transportation alternatives were subjects of the Space Shuttle Advanced Solid Rocket Motor Program Final Environmental Impact Statement, March, 1989.
- DOA-5** NASA agrees with this clarifying statement.
- DOA-6** The U. S. Environmental Protection Agency (EPA) observed soil, hydrologic, and vegetative characteristics of these wetland areas, as prescribed in the new federal wetland identification and delineation method. As described in Section 2.3 of the SPEIS, EPA conducted an investigation of the ASRM site to determine size and extent of existing wetlands.
- DOA-7** NASA agrees with this change.
- DOA-8** NASA agrees with this clarification.
- DOA-9** NASA agrees with this clarification.

COMMENTS

DOA-10 high water of a navigable water of the United States. Construction of the proposed dock requires Section 10 authorization since that work will be conducted within the ordinary high water of the Pearl River, a navigable water of the United States. None of the wetlands which would be impacted by the ASRM project are located within the ordinary high water of a navigable water. Therefore, the citation of Section 10 in paragraph 3.3.2. is not appropriate.

DOA-11 - "Construction of the project facilities, except for timber harvest activities excluded by law from Section 404 review . . ." This statement is confusing. Discharges of dredged or fill material associated with normal silvicultural activities are excluded by law from Section 404 permitting requirements (referred to as Section 404(f) exemptions) provided the activities are part of an established (i.e., ongoing) silviculture operation and are not preliminary to a change in use. These activities include discharges incidental to the harvesting of merchantable timber and the replanting of the site. The harvest of timber, as conducted by NASA, did not involve the "discharge of dredged or fill material into a water of the United States" and therefore, is not regulated under Section 404 and is not contingent upon the issuance of such a permit.

DOA-12 - In paragraph 3.3.4., "appropriate species" should be clarified. More specific information should be given, such as "native bottomland hardwood species."

DOA-13 Page 8-2. - Page 8-2 is a duplication of page 8-3.

DOA-14 Page A-28. - Although the document discusses wetlands and functional values, no quantification of the habitat values, i.e., habitat unit values (HUVs) for fish and wildlife losses are presented. Arbitrary utilization of the 1977 HEP methodology by NASA's contractor apparently without concurrence of the U.S. Fish and Wildlife Service or State resource management agency, appears to circumvent the requirements of the Fish and Wildlife Coordination Act. If these agencies concur with NASA then the document should contain an appendix presenting these agencies views, i.e., U.S. Fish and Wildlife Service Coordination Act Report.

DOA-15 Additionally, the biological opinion and supporting correspondence concerning Endangered, Threatened, and Rare species from the U.S. Fish and Wildlife Service and/or state wildlife management agency should be presented to support NASA's conclusions presented on pages 3-10 and 3-11.

RESPONSES

DOA-10 NASA agrees with this correction.

DOA-11 NASA agrees with this clarification.

DOA-12 All plant species used in wetland and upland restoration/vegetation activities will include only species native to bottomland hardwoods, pine-savannah, and other native plant communities found in the project area.

DOA-13 The correct page 8-3 is included on the following page.

DOA-14 In developing the wetland mitigation plan for the ASRM site, NASA's contractor did not use the U.S. Fish and Wildlife Service's Habitat Evaluation Procedure (HEP) (USFWS, 1980). As summarized in Appendix B of the mitigation plan (NASA, 1990), which was submitted with the Section 404 permit application to the Army Corps of Engineers, Vicksburg District, the contractor's approach to determining the suitability of existing habitats for wildlife "steers a middle course between unsystematic generalizations born of anecdote and inventory on one hand, and on the other, the precise, exhaustive calculations of Habitat Suitability Indices for selected individual species, as described in the USFWS HEP." This approach is similar to an early version of the HEP (Flood et al., 1977) and was used because of the limited time available to compile the conceptual mitigation plan. It is anticipated that additional wildlife studies using HEP (or another quantitative method) will be conducted with full concurrence of the U.S. Fish and Wildlife Service and/or other resource management agencies, as part of the development of a final wetland mitigation plan.

We disagree that the contractor's use of this method circumvented requirements of the Fish and Wildlife Coordination Act. Because the ASRM project does not involve impounding or diverting water, the Fish and Wildlife Coordination Act is not applicable.

DOA-15 Biological Assessments as necessary were prepared for the FEIS. The Biological Opinion for the ringed sawback turtle is attached.

COMMENTS

RESPONSES

DOA-16 Not being privy to NASA's internal regulations for the implementation of NEPA, we are uncertain of the required coordination and extent of public review of a draft EIS supplement, i.e., publication of a notice of intent in the Federal Register and notice of availability. However, the Corps regulations implementing NEPA require the extensive circulation and solicitation of public input and comments on draft EIS supplements. The results of that review are always documented in the Final EIS supplement. There is no indication that a draft document was reviewed by all interested groups.

DOA-17 In the event additional information concerning all of the environmental consequences of the proposed action, i.e., socioeconomic, cultural, fish and wildlife, 100-year flood plain, are presented in previous documents and for clarity of independent review, reference to the relevant sections and supported conclusions should be presented in this and/or any other subsequent FEIS Supplement.

If you have any questions concerning these comments, please contact Mrs. Peggy Holliday, telephone (601) 631-7136.

Sincerely,


Edward G. McClellan, P.E.
Chief, Regulatory Branch

DOA-16 Alternative procedures were granted to NASA under Title 40 CFR, Section 1502.9(c)(4) of the CEQ Regulations. These procedures were made known to the public thorough NASA advertisements, press releases, and public meetings. Official notice of alternative procedures for this SFRIS was also published in the Federal Register, Vol. 55, No. 165, p. 34733.

DOA-17 The supplement is not intended to revisit issues other than those specifically addressed in the SFRIS. The topics mentioned in this comment are addressed in full in the FRIS (NASA, 1989).

RESPONSE EXHIBIT



United States Department of the Interior
FISH AND WILDLIFE SERVICE



P.O. Drawer 1190
Daphne, AL 36528

March 22, 1989

Ms. Rebecca C. McCaleb
Environmental Officer
John C. Stennis Space Center
Stennis Space Center, MS 39629-6000

IN REPLY REFER TO:
Log No. 4-3-89-160

Dear Ms. McCaleb:

This responds to your letter of March 10, 1989, requesting the Fish and Wildlife Service's review of a biological assessment on the ringed sea-back turtle. This species' range includes the planned Advanced Solid Rocket Motor Facility at the Stennis Space Center, Hancock County, Mississippi. Considering the lack of suitable habitat for the ringed sea-back turtle at the project site and the lack of indirect impacts on the turtle or its habitat, we concur with your finding that neither static testing nor construction of the proposed facility would affect the ringed sea-back turtle.

We appreciate the opportunity to comment on this matter.

Sincerely,

Larry E. Doloban
Field Supervisor

Table 8-1. Agency Consultation.

Name	Agency	Location	Subject of Consultation
Freddy Baylis	Hancock County Agricultural Extension	Gulfport, MS	Application rates for fertilizer and lime on agricultural soils (4/25/90)
Dr. Peter Blancher	Canadian Wildlife Service	Ottawa, Ontario	Acid rain effects on wildlife (5/3/90)
Jeff Brandt	Environmental Protection Agency	Corvallis, OR	Acid rain effects on plants (5/3/90)
Maria Doa	Environmental Protection Agency	Washington, DC	Formation of acid-coated Al ₂ O ₃ particles (4/25/90)
John Ervin	Environmental Protection Agency	Research Triangle Park, NC	INPUFF dispersion model (4/6/90)
Michael Gaydos	U.S. Geological Survey	Jackson, MS	Background water quality data for southern Mississippi. (6/22/90)
James Gibson	U.S. Geological Survey	Ft. Collins, CO	Acid rain data for Stennis Air Station (4/6/90)
Susan Griffith	Environmental Protection Agency Office of Solid Waste	Washington, DC	EPA 3-minute HCl guideline (5/31/90)
Priscilla Halloran	Environmental Protection Agency	Washington, DC	RACs for HCl (4/25/90)
Michael Haramis	U.S. Fish and Wildlife Service	Patuxent Research Center	Acid rain effects on wildlife (5/2/90)
Dwight Hlustick	Environmental Protection Agency	Washington, DC	Regulatory direction on the HCl guideline for municipal hazardous waste incinerators (6/4/90)
Peggy Holiday	U.S. Army Corps of Engineers	Vicksburg, MS	ACOE/EPA Memorandum of Agreement for wetlands delineation; parameters of Section 404 permitting process (4/9/90)

Table 8-1. Agency Consultation (continued).

Name	Agency	Location	Subject of Consultation
Bob Israel	Environmental Protection Agency	Washington, DC	EPA delisting of aluminum oxide (4/11/90)
Edward McGregor	U.S. Army Corps of Engineers	Vicksburg, MS	Wetland Evaluation Technique II (4/13/90)
Larry Marcy	U.S. Army Corps of Engineers	Vicksburg, MS	Arrangements for site visit; spoil status of existing deposit areas (4/6/90); Site visit (4/12/90)
Steve Miranda	Mississippi Cooperative	Mississippi State, MS	Life history of southern Mississippi native fish (6/22/90)
Jim Morris	Mississippi Bureau of Pollution Control	Jackson, MS	Mississippi state water quality criteria (5/9/90)
Kent Schreiber	U.S. Fish and Wildlife Service	Kearneysville, WV	Acid rain effects on wildlife (5/3/90)
Tommy Thornhill	U.S. Fish and Wildlife Service	Daphne, AL	Sensitive areas for fish (3/29/90); need for fall/late summer plant & animal surveys (4/25/90)
Dwight Wylie	Mississippi Bureau of Pollution Control	Jackson, MS	Origin and application of 3-minute HCl Recommended Air Concentration (RAC) to the NASA ASRM project (5/21/90)
Various staff members	NASA	Stennis Space Center, MS	All topics covered in SFEIS (various dates)

Letter Number 10

from
W.F. Willis
Tennessee Valley Authority
Knoxville, TN

COMMENTS

RESPONSES

TENNESSEE VALLEY AUTHORITY
KNOXVILLE TENNESSEE 37902

SEP 2 6 1990

WFW-1 Response to SPIS is noted.

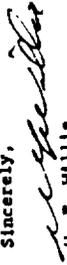
Rebecca C. McCaleb, Ph.D.
CAO/Environmental Projects Officer
National Aeronautics and Space
Administration
John C. Stennis Space Center
Stennis Space Center, Mississippi 39529-6000

Dear Dr. McCaleb:

In response to your August 9 letter, the Tennessee Valley Authority does not have any comments to submit on the Supplemental Final Environmental Impact Statement on the Space Shuttle Advanced Solid Rocket Motor Program. We appreciate the opportunity to review the document.

WFW-1

Sincerely,



W. F. Willis
Executive Vice President and
Chief Operating Officer

Letter Number 11

from
Lydia D. Schultz
Waveland, MS

COMMENTS

Dr. Rebecca McCaleb
National Aeronautics Space Admin.
Stennis Space Center
Bay St. Louis, MS 39320

Dear Dr. McCaleb:

I am writing my thoughts, questions and concerns to be included in the Appendix to the Supplemental Environmental Impact Statement.

As I have stated in the past, publicly and to you privately, I know that the decision to test Advanced Solid Rocket Motors at Stennis Space Center was a political decision: somebody's pork barrel for their constituents. It was certainly not one done with the best interests of the people, their health and their environment. Otherwise, the thought to test ASRBs would never have been conceived and carried out.

LDS-1 | The 275 tons of hydrogen chloride and the 175 tons of aluminum oxide dust are extremely alarming to me. Allow me to touch on some personal moments.

When I first learned about this project, I went through periods of denial. I could not believe that this would be "allowed" to take place. There is a part of me that is patriotic and naive and does not want to accept what our government does and allows in the name of "progress" or pork barrels. Anyway, I went through fear, I went through anger, but most of all I went through depression. Each time I think of the possible ramifications of these tests, one or many, I can sink to low ebbs.

I treasure what we have in Hancock County. Everyone knows I am a birder, but it goes beyond that. It is the wildness quality that remains in much of the County, ironically a lot of that can be contributed to NASA. For so long you have been a good neighbor who I valued and felt proud to have here. But that relationship has turned sour and I see clearly with my eyes wide open that this project must be stopped.

LDS-2 | I still want to know the results of the consortium of scientists called together by Dr. Ralph Fove with Mississippi State University. This consortium was promised to the people of South Mississippi as an unbiased group of knowledgeable people who would look at the project rationally. We were promised the outcome. NASA publicly agreed.

LDS-3 | I have received the names of the people who participated in the consortium but at this point I would like to request a personal statement from each of the members of this consortium, to be included in the Appendix to the Supplemental Environmental Impact

RESPONSES

LDS-1 | To clarify the quantities to be emitted, one ASRM test will emit 216 tons of aluminum oxide particles and 127 tons of HCl (see SFEIS, Table 4-1)

LDS-2 | The Mississippi University Research Consortium is comprised of the University of Mississippi, Mississippi State University (MSU), Jackson State University, and the University of Southern Mississippi. Dr. Ralph Fove, Vice President of Research, MSU, was selected by the university representatives to provide their collective comments or opinions. Two letters of review (see Attachments 1 and 2) have been received to date. The list of university attendees is included in Dr. Fove's letter of May 30, 1990.

LDS-3 | See answer LDS-2.

COMMENTS

RESPONSES

- LDS-3** **com.** Statement. Mainly I want to hear from the staff members of our state universities, not those employed by NASA. I want unbiased, uninfluenced opinions.
- LDS-4** I was told that the recommendations that this consortium did come up with were angrily rejected by NASA. Is this true?
- LDS-5** I would also like the list of these people and the cover letter from Ralph Powe and his stated outcome included in the appendix.
- LDS-6** Hydrogen chloride is hydroscopic. It seeks water to form concentrated hydrochloric acid. NASA continually maintains that the plume of gases will rise high, go with prevailing winds (over my businesses and home, children, dog and birds and plants) and disperse in "insignificant" amounts. The reports available from the Fish and Wildlife Service and another completed by Esher and Bradshaw state the fragility of our area to any increased acidity. Some of our rains are already at a level of acidity to be alarming, especially when you take into account the aluminum that you plan to release with the hydrogen chloride. Can NASA still maintain that 275 tons of hydrogen chloride will be insignificant?
- LDS-7** The aluminum is another issue. Yes. We do have large amounts of aluminum in our soil. I have a grave fear that if enough aluminum is released along with enough hydrochloric acid reaching the ground that we could end up with a sterile environment in some areas. I do not have to have a Ph D behind my name to know that acid activates aluminum and once aluminum is activated, that's it.
- LDS-8** I also do not accept the premise that all of these toxins will rise as you predict. What will your little 60 foot ramp be constructed of? Concrete? The corrosiveness of the emissions should eat that up with each 2 minute test. Will we be guaranteed that that ramp will be rebuilt before each test?
- LDS-9** You have not ever addressed the presence of the school in line with the cloud of toxins. How will that be handled?
- LDS-10** The computer model on which you base the whole Environmental Impact Statement and its Supplement may not be accurate. As I understand from other scientists, models do not usually work. They must be tested and retested. Proof, documentation and controlled tests must be completed. The people of Southern Mississippi will not have that luxury with these extremely toxic tests. Will you stop the tests? Then you may get things worked out to satisfy you, but then won't another firing of the motors just be another guessimate? All of this sounds too iffy for me and our environment.
- LDS-11** On Friday, September 7, 1990, a motor for a Titan IV was "dropped" at Edwards Air Force Base in California. The explosion sent up a cloud of what reporters called "toxins" and "poisons." The Titan IV uses the same exact fuel as the ASRM. I would like to request an

- LDS-4** NASA personnel worked well with the Consortium representatives. At no time were recommendations angrily rejected."
- LDS-5** See anaver LDS-2.
- LDS-6** The behaviors of HCl and water in the atmosphere are described in detail starting on page 4-15 of the SPEIS. The response and sensitivity of the environment to both the expected conditions during testing and the unexpected conditions (rain during or shortly after a test) are described in the SPEIS. In both cases, the impacts of testing will be neither significant or long lasting.
- LDS-7** Anaver LDS-1 has clarified the quantities to be emitted. The impacts to the environment and human health will not pose a problem as described in the SPEIS. The sensitivity of the environment to the effects of ASRM testing were considered and are described in the SPEIS. NASA's projections are based on the chemistry of the materials released, knowledge of the local environment and a detailed understanding of the ASRM plume characteristics.
- LDS-8** NASA is aware of your concerns, fears, and anger. We have attempted to provide you with detailed, factual information to allay your concerns. We believe the information we have compiled and analysis conducted by Ebaeco was professionally sound. Additionally, a number of outside agencies will be reviewing the report and findings. This outside review ensures that the integrity of the analysis is preserved. The SPEIS has considered all information made available concerning the condition of the local environment. We acknowledge that all ecosystems are fragile and should be preserved. NASA believes that the ASRM testing program can be accomplished without degrading the environment or endangering public health. Strict permit conditions will be established by the Mississippi Department of Environmental Quality to ensure that the program will not cause adverse effects.
- LDS-9** Mobilization of aluminum in soils is discussed in Section 4 of the SPEIS. Acidic water with a pH of 4 or lower can mobilize aluminum in soils and pond sediments. However, once aluminum is mobilized, naturally occurring organic acids (humic and fulvic acids) will bind (i.e., form complexes with) the temporarily free aluminum. The published scientific literature indicates that over 90 percent of the mobilized aluminum will be rapidly bound

to organic acids. The remaining 10 percent will bind with naturally occurring minerals. The bound forms of aluminum are not considered toxic. In fact, aluminum is one of the least toxic naturally occurring metals. Since ASRM testing will not increase the acid deposition on or around SSC, the testing will not increase the amount of aluminum mobilized in the soils. Thus, there is not a possibility that the environment could become at all sterile.

The chemistry of aluminum is complex; we will not end up with a situation of acid from the HCl emission "activating" the aluminum. Even under worst case-type conditions, the amount of acidity is extremely low. The soils will be able to readily accommodate any such small increases, and the aluminum will remain bound to the soil and thus nontoxic.

LDS-9

The plume rise predictions presented in the SFEIS are based on well established thermal buoyancy and plume rise equations. The equations contain variables which take into account all weather conditions, both dry and moist.

LDS-10

The deflector ramp surface will consist of highly reinforced concrete on all areas except the central portion which will experience the largest impacts of heat and velocities. The central portion will be surfaced with a special refractory or "heat resistant" concrete. The ramp will be restored as necessary. NASA will rebuild damaged sections before each test after careful inspection and structural evaluation.

LDS-11

The location of the school as well as the locations of SSC personnel and the surrounding communities were considered during evaluation of the impacts. The concentrations of exhaust products and the deposition of aluminum oxide at the school will be very low compared to air quality standards that have been designed to protect human health with a large margin of safety. We obviously are concerned with impacts to any populations, but, in particular, sensitive populations such as school children. Considerations of all sectors of our population were given in the Health Effects Section (Section 5.0) of the SFEIS.

LDS-12

The models used to predict the plume composition and rise in the atmosphere agree very well with observations of actual tests. The model used to predict the ground-level air concentrations, INPUFF 2.3, has been reviewed by EPA, the State of Mississippi, and the State of Utah. INPUFF

COMMENTS

LDS-13
COML

Environmental Impact Statement to be done addressing a possible accident like the one at Edwards Air Force Base. Knowing that the ratio of solid fuel to TNT is 1:1, I find the possibility of such an accident alarming. I also know it is possible.

LDS-14

This is sad for me to see NASA blatantly rationalizing irrational statements. Even your own employees have delivered anonymous information to me. I have continuously received unmarked white envelopes with information. Why, if what you say is accurate?

I feel that this, from inception through the original Environmental Impact Statement to the Supplement to the Environmental Impact Statement, has been shrouded in distortions, omissions of facts, and manipulations. Our environment and soil in Mississippi is most fragile and cannot withstand the acid you propose to impose upon it.

Lydia D. Schultz
914 Highway 90 West
Waveland, MS 39374

Home!
P. O. Box 2177
Bay St. Louis, MS 39521-2177
(601)467-2473 (wk) 467-3810 (home)

RESPONSES

2.3 is based on state-of-the-art air dispersion models used routinely in air quality assessments. Gaussian dispersion models such as INPUFF 2.3 are continually reevaluated and verified by EPA and air pollution control agencies across the country. Therefore, we feel confident in the computer modeling presented in the SFEIS.

LDS-13

The Final EIS on the ASRM program (March 1989) as well as Section 5.6 of the SFEIS addressed possible accident scenarios such as the one at Edwards Air Force Base. The fuel in the Titan 4 solid rocket motor is very similar to the fuel contained in an ASRM. Both are classified as "mass fire" propellants, which means that, in the finished state the propellant is capable of burning very rapidly, but not detonating. Accidental ignition of the Titan 4 segment at Edwards Air Force Base resulted in a mass fire, not detonation, lasting approximately 90 seconds and a cloud primarily of aluminum oxide and hydrogen chloride rising to approximately 12,000 feet prior to dispersing. The unfortunate incident and fire behaved as predicted. A copy of the official incident report can be obtained through the Freedom of Information Act Office, U.S. Air Force, Edwards Air Force Base after it is officially released.

NASA will have an Emergency Response Plan to be automatically implemented in the case of a similar event at SSC that will alert the potentially affected workforce and public. Advisories and instructions will remain in effect until such time ambient air quality in exposed areas is certified safe. However, projections in the SFEIS and experience at Edwards Air Force Base are that people outside of the immediate accident area should not be at risk.

LDS-14

Since we do not know the contents of your additional information, we cannot properly respond.

RESPONSE EXHIBIT



Office of Vice President for Research

September 18, 1990

Dr. Rebecca McCaleb
Environmental Project Officer
NASA
John C. Stennis Space Center
Building 2423
Stennis Space Center, MS 39529

Dear Dr. McCaleb:

During the meeting of the Mississippi Research Consortium and Environmental Task Force at Stennis Space Center on March 1, 1990, a statement was developed for general release. That was forwarded to you earlier. Since that time, the task force has made some more specific comments, and I wanted to forward these to you for your consideration. I would certainly be happy to discuss any of these as appropriate.

Sincerely,

Ralph E. Fove

Ralph E. Fove
Vice President for Research

RF

cc: Environmental Task Force
Chief Research Officer

RESPONSE EXHIBIT

**Mississippi Research Consortium
Environmental Task Force
Comments on Environmental Issues: ASRM Testing**

1. Need to devote more specific attention to effects on wetlands
a. plantation trees
b. invertebrate assemblage
c. select indicator species at trophic level
 2. Now taking water quality approach versus ecosystem approach. Perhaps should take both.
 3. Need to measure storm events.
 4. Analyze sediments in addition to soils.
 5. Verification by outside labs is extremely important.
 6. Groundwater assessment is important.
 7. Should encourage outside utilization of the environmental data base developed in this program.
 8. Should encourage peer-reviewed publication of results of studies using the environmental data base.
 9. The model should be continually upgraded as empirical data becomes available.
 10. It would be helpful to develop a report on state-of-the-art scrubber technology.
 11. Copies of any available reports from Kennedy Space Center on environmental impacts would be helpful to the Task Force.
 12. The precipitation measuring stations are not very extensive. Perhaps more should be added.
 13. There are two kinds of wetlands that should be addressed.
 14. Sampling should take into account the complete spectrum of habitats.
 15. Testing should be conducted under 'Good Laboratory Practice' standards.
 16. Data and protocol should be reviewed.
 17. May need to use additional techniques and protocols in some instances.
18. Need to look at submerged sediments in the water due to the probability that chemicals adsorbed into terrestrial sediments and washed into the wetlands environment will become associated with sediments and be overlooked in surface water sampling.
 19. Need to address the aquatic or wetland ecosystem with the same intensity as the terrestrial ecosystem. Answer the question: "Does procedure of firing the ASRM affect the aquatic ecosystem?" Need to collect pre-test infusant, planktonic, and other parameters and compare to foster test evaluations.
 20. The Mississippi Research Consortium Environmental Task Force should continue to function over the life of the project to:
 - a. develop detailed protocols
 - b. review and revise protocols
 - c. review specific data sets
 - d. participate in the publication process
 - e. participate in other appropriate activities.

Letter Number 12

from
Bertin C. Chevis, M.D.
Hancock Medical Center
Bay St. Louis, MS

COMMENTS

September 19, 1990

Rebecca McCaleb, M. D.
John C. Stennis Space Center
Building 1100
Stennis Space Center, MS 39529

Re: Advanced Solid Rocket Motor
and the Environment Impact Statement

Dear Dr. McCaleb:

I received a copy of the Supplemental Environmental Impact Statement which says "final". In reading this, I felt that this was the final statement, but it is now my understanding that this is not a final Environmental Impact Statement on the Space Shuttle and Advanced Solid Rocket Motor. Therefore, I am asking you to extend the comment period by an appropriate time, since this was apparently not a true final statement, therefore not encouraging any further comments.

BCC-1

I am still of the opinion after the public hearings that there are still many medical questions concerning the health effects of the Advanced Solid Rocket Motor. I am very concerned about the release of hydrochloric acid, aluminum oxides, acid coated particles and carbon monoxide. In talking to various health experts and reading various literature from different sources, these are of very much concern to me and I feel the only way that we can work this out is to have a face to face meeting with experts who are pulmonologists, toxicologists and medical experts and environmental health effect personnel. The EPA would be invited. I believe Dr. Perle should be invited and Dr. Kirkland, and any scientists who are on the cutting edge of research and knowledge in this process.

This has a potential to be very detrimental to the health of my community and my patients. At this point, I cannot agree that the Advanced solid Motor Rocket Testing

BCC-2RESPONSES**BCC-1**

On August 10, 1990, the SFEIS on the ASRM Program was mailed. All transmittal letters, press releases, and notices, such as the one in the Federal Register, stated where to send review or comment letters and that all letters would be answered on an individual basis. As you are aware, this commitment was also made during the public meeting. The original published public review closing date was October 1, 1990, and it has already been extended through October 8, 1990.

NASA has fully complied with the National Environmental Policy Act by widely advertising and distributing the SFEIS, providing multiple public forums for question and information exchange, and encouraging comment letters during a review period in excess of 52 days.

In the course of this highly publicized process, adequate time has been provided for comment by all sectors of the public, including the medical profession. Therefore, no extension of the comment period past October 8, 1990, is justified. You are encouraged to forward your comments on the ASRM program by that date.

The reviews of recognized medical researchers including those of Dr. Daniel Perl and Dr. Leonard Kurland were presented in the SFEIS. Their original comment letters were reproduced in the SFEIS and their comments incorporated into the final text. Dr. Thompson's staff with the MS State Health Department is independently evaluating the potential human health effects from static testing ASRMs at Stennis Space Center. The views and recommendations of the State Health Department will be incorporated into any Air Emissions Permit issued by the MS Department of Environmental Quality. We will be happy to cooperate with the State Health Department if they host a meeting with the medical community concerning this issue.

BCC-2

COMMENTS

RESPONSES

Page 2
Dr. Rebecca McCaleb

would not be injurious to the people in this community and the surrounding communities. I believe Dr. Thompson with the State Health Department, who I will be notifying shortly, should be involved very closely with this.

Sincerely yours,

Bertin C. Chevis MD

Bertin C. Chevis, M. D.
Chief of Staff
Hancock Medical Center

BCC:nps

Letter Number 13

from
Jay Hanson
Kailua-Kona, HI

COMMENTS

RESPONSES

September 12, 1990

Dr. Rebecca C. McCaleb
NASA
Building 1100; Code GA00
Stennis Space Center, Mississippi 39529-6000

Dear Dr. McCaleb,

Having reviewed the Supplemental Final Environmental Impact Statement for the Space Shuttle ASRM program (August 1990), I have a few comments (please bear with me as I am not a scientist).

JH-1

#1. Chlorine, by itself and photodissociated from hydrogen chloride, is a major exhaust product of solid rocket motors. However, the EIS has no mention of chlorine being mutagenic.

JH-2

It is my understanding that chlorine is mutagenic. If so, a mutagen is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

JH-3

What are the possible risks for workers due to exposure to mutagenic substances? Are pregnant women at greater risk? Aren't carcinogenic studies on chlorine presently underway by the National Toxicology Program? If chlorine is shown to be carcinogenic, what would be the impact to the continued use of ammonium perchlorate for fuel?

JH-4

JH-5

#2. It appears that the precursors for dioxin production, benzene rings and chlorine, are present in solid rocket fuel and may inadvertently be produced during engine testing. Furthermore, dioxin is among the most dangerous material known. If dioxin production is theoretically possible, what studies have been done to see if it actually occurs? If no studies have been done, why haven't they? What other types of dangerous compounds are theoretically possible?

The remainder of my questions may be outside the scope of the EIS, however the NEPA process, in many cases, is the only practical discovery vehicle for the average citizen. I believe citizens will demand to know this information sooner or later, therefore I will inquire now.

JH-1

Chlorine atoms will not be photodissociated from HCl molecules in the exhaust plume. Free chlorine ions in the atmosphere are very reactive. Any free chlorine atoms emitted in the exhaust plume would quickly react to form HCl or other elementary stable molecules.

JH-2

Since free chlorine atoms will react to form HCl and will not remain in their ionic state, the toxicity of free chlorine atoms was not evaluated. Additionally, the concentrations of chlorine gas emitted during a test are so low that they do not represent a health concern. The effects of HCl on humans, however, is discussed in detail in the SFRIS. HCl is not considered a mutagen.

JH-3

Some mutation data on chlorine gas exist. However, as discussed above, free chlorine atoms will not remain in their ionic state in the atmosphere and the concentrations of chlorine gas will be extremely low. Since the human body is equipped to handle small doses of mutagens on a daily basis, the low concentrations of chlorine gas in the exhaust plume will not cause adverse health effects.

JH-4

The National Toxicology Program is currently studying the carcinogenic effects of drinking water disinfectants such as chlorine. These disinfectants are being tested for carcinogenic, mutagenic, and direct toxicological effects on the kidney, liver, and cardiovascular system as well as for metabolic fate and pharmacokinetic values. HCl is not considered a mutagen or carcinogen. Since no carcinogenic effects from HCl will result from the ASRM testing or Space Shuttle launching, no change in the use of ammonium perchlorate is being considered.

JH-5

The effects of dioxins from ASRM testing were not addressed in the SFRIS because dioxin production will not occur during test firing. The extremely high temperatures, 6000° F, and the highly oxidizing environment prevent the formation of large organo-chloride compounds such as dioxins. The combustion conditions during ASRM firings break down large molecules and produce smaller, elemental compounds such as HCl, H₂O, CO₂, and Al₂O₃.

COMMENTS

RESPONSES

JH-6

#3. Is it true that Aerojet and Hercules are developing cleaner solid propellants on behalf of the Strategic Defense Initiative Organization (SDIO)? If a cleaner propellant were developed for SDIO, would NASA switch to it? If so, wouldn't it make sense to delay the ASRM program to see if a cleaner propellant is feasible?

JH-7

#4. The National Research Council has stated that a new generation of all-liquid propellants should be developed to replace solid boosters. Among reasons for the recommendation was the pollution of the atmosphere with chlorides. In view of this recommendation, why does NASA continue to pursue the ASRM program?

JH-8

#5. Chlorine has been shown to deplete stratospheric ozone. Unfortunately, risk analysis is not well known to the general public. Therefore, could you calculate the risk due to ozone depletion from the use of ammonium perchlorate fuel, from its first use through the year 2020? Can you state the risk in terms of how many people are expected to die of cancer due to increased UV radiation?

JH-9

#6. NASA has a history of dubious risk assessments. Before the Challenger exploded in 1988, killing all aboard, the agency's official estimate of the probability of a disastrous shuttle accident was 1 in 100,000. After the explosion, NASA revised the estimate to 1 in 78.

Could you please explain the reason for this original error. Was it just a screw-up by NASA or a deliberate deception in the name of National Security?

The foregoing notwithstanding, this EIS appears to be NASA's most objective to date. I hope it will be used as a basis to make future EISs even more honest.

Thank you,



Jay Hanson 808-322-7268

78-6622 Alii Drive

Kailua Kona, HI 96740

JH-6

Two contracts in support of the Strategic Defense Initiative Organization were awarded to Aerojet Solid Propulsion Company and Hercules Aerospace Company to develop alternate clean propellant for solid rocket motors. The contracts are expected to be completed in 1993. The Air Force Flight Test Center, Edwards Air Force Base, California is responsible for the contracting activity. Assuming successful fulfillment of the objective, much more development and testing of hardware and manufacturing processes from prototype to full scale systems would have to follow. A decision to switch to a different propellant would involve a comprehensive evaluation of environmental, safety, technical, and economic factors.

NASA must consider current and future launch/mision requirements as well as technical and cost issues when planning propulsion systems and the proper mix of manned and unmanned spacecraft. NASA continues to be concerned about potential environmental effects associated with its activities. At the same time, NASA recognizes that almost any man-made activity and advances in technology may have some associated impacts. NASA attempts to balance its mission for space advancement with the impacts. Alternative propellants were addressed in Section 2.2.1 of the Space Shuttle Advanced Solid Rocket Motor Program Final Environmental Impact Statement, March 1989. Regardless, NASA continues to explore alternative technology and study the potential for adverse environmental consequences.

JH-7

As stated by NASA in the 1990 Aerospace Safety Advisory Panel Annual Report (p. 45), "the proposed ASRM design is responsive to many of the guidelines for a new motor design stated by the National Research Council Panel on the Technical Evaluation of NASA's Redesign of the Space Shuttle Solid Rocket Booster; use of an inherently tolerant design; detailed understanding of how the design works; a full spectrum of tests; performance testing of seals; validation of analytical computations; control of processes and materials; and risk reduction through product improvement." Time, risk, economics, adaptability to existing launch systems and infrastructure, required development, and environmental factors were some of the important considerations balanced by NASA leading to the decision for proceeding with the ASRM program as well as fulfilling many of the National Research Council's recommendations. However, NASA will continue to review and participate in alternate propulsion system development as described in JH-6.

Since ASRM exhaust gases from static firing do not rise high enough or reside in the atmosphere for no longer than two to three weeks, no impact to stratospheric ozone will occur as a result of the test activity addressed in the SPEIS. Atmospheric issues of solid rocket motor exhaust released during space shuttle launches were addressed in the 1978 Space Shuttle Program Final Environmental Impact Statement. Stratospheric ozone impacts by space shuttle launches were recently reassessed in the following reports:

1. Watson, R.T., M.J. Kurgio, M.J. Prather, and F.M. Ormond. 1990. Present state of knowledge of the upper atmosphere: an assessment report. Report to Congress. NASA Reference Publication 1242. 111-122.
2. Prather, M.J., M.M. Garcia, A.R. Douglass, C.H. Jackman, M.K.W. Ko, and M.D. Sze. 1990. The impact of the space shuttle on stratospheric chemistry and ozone. Space Shuttle. 22 pp.

In the 1978 Space Shuttle Program Final Environmental Impact Statement, Section 4.2.2.4.1, a 0.25 percent ozone reduction and 0.5 percent increase in BHUV radiation was projected from launch activities. These effects may lead to some increase in the incidence of nonmelanoma skin cancer among susceptible individuals. However, in the 1978 analysis, the increase in nonmelanoma skin cancer could not be projected because of the great variability of BHUV and biological responses. It was stated that, "If any increase does occur, it must be small relative to the current estimated U.S. incidence of about 300,000 cases per year and consequently will not be detectable against the annual statistical fluctuations of the reported cases." Any potential increase in the more serious form of skin cancer, melanoma, which comprises less than 3 percent of the total skin cancer cases, was less correlatable and could not be projected. Furthermore, the actual launch rates are much less than those projected in the 1978 impact statement, therefore, the impacts are far less than those described in the document.

JH-9

NASA's program management and safety and mission quality functions rely on extensive testing and intensive reviews prior to each Shuttle flight and not on numerical risk assessments. Consequently, Shuttle accident probability data are not generated or calculated routinely, and the decision to launch is made for each mission only when all technical issues relative to safety have been resolved. Resolution of such issues is based on in-depth engineering evaluations and not on numerical estimates.

NASA, however, has developed Shuttle accident scenario probability data for use in environmental analyses and in independent safety evaluations for missions with a nuclear powered payload. Recently, the data was developed for the Ulysses mission and incorporated into the NASA Final Environmental Impact Statement. (Tier 2), June 1990.

Letter Number 14

from
Claire J. Schiff
Summit, N.J.

COMMENTS

51 Evergreen Road
Summit, N.J. 07901
September 6, 1990

National Aeronautics and Space Administration
Attn: GAO/Environmental Projects Officer
John C. Stennis Space Center
Stennis Space Center, Mississippi 39529-6000

RE: Supplemental Final EIS
Space Shuttle Advanced Solid Rocket
Motor Program

Sir:

I refer to the notice published in the August 29, 1990 Federal Register (p. 35381) of availability of the above study.

I would like to know whether the impact of the Advanced Solid Rocket Motor Program on stratospheric ozone was studied in conjunction with this Supplemental Final EIS, and whether there exists any environmental study of the effect of rocket launches on stratospheric ozone.

Thank you for your information.

Sincerely yours,

Claire J. Schiff
Claire J. Schiff

CJS-1

RESPONSES

CJS-1

Since ASRM exhaust gases from static firing do not rise high enough or reside in the atmosphere for longer than two to three weeks, no impact to stratospheric ozone will occur as a result of the test activity addressed in the SFEIS. Atmospheric issues of solid rocket motor exhaust released during space shuttle launches were addressed in the 1978 Space Shuttle Program Final Environmental Impact Statement. Stratospheric ozone impacts by space shuttle launches was recently reassessed in the following reports:

1. Watson, R.T., M.J. Kurglo, M.J. Prather, and F.M. Ormond. 1990. Present state of knowledge of the upper atmosphere: an assessment report. Report to Congress. NASA Reference Publication 1242. 111-122.
2. Prather, M.J., M.M. Garcia, A.R. Douglass, C.H. Jackman, M.K.W. Ko, and M.D. Sze. 1990. The impact of the space shuttle on stratospheric chemistry and ozone. Space Shuttle. 22 pp.

Letter Number 15

from
Carolyn Masters
Hattiesburg, MS

COMMENTS

76 Shady Lane
Hattiesburg, MS 39402
August 29, 1998

Dr. Rebecca C. McCaleb
Environmental Projects Officer
John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

Dr. Dr. McCaleb:

Thank you for your efforts in explaining the ASRM testing program at the John C. Stennis Space Center. I am enclosing my evaluation form of the meeting. As you can tell, I found from the FEIS and from the MASA panel little hard evidence which addresses my main concern - the environmental impact of 27,426,328 lbs. of hydrogen chloride which will be released into the atmosphere during the 38-year test period.

You may wonder what I mean by hard evidence. I think answers to these questions would contain the hard evidence for which I am looking.

1. Does MASA have equipment to predict when, where, and how much of the hydrogen chloride will mix with water vapor in the air and fall as acid rain deposition downwind of the test site? The upper atmosphere expert, Scott, told me that thunderstorm patterns are caused by a constant recycling process which can create cloud formations reaching as high as 50,000 feet. That means that the hydrochloric acid formed from the very hygroscopic hydrogen chloride and water vapor will eventually fall to the earth.

2. If so, when will MASA use this equipment to model a simulated plume in order to include this hard data in their predictions?

3. Another expert from the panel said that the buffering agent for the hydrochloric acid will be calcium carbonate in the water and soil. When will MASA accumulate the hard evidence to determine how much of this buffering agent is left in our surface and ground waters and in our soil over the test site and downwind from the test site?

In the spirit of those who tried to call a halt to the Challenger liftoff which ended in tragic death and disappointment, I persist in my quest for satisfactory answers which will strengthen my confidence in NASA's mission. I look forward to your reply.

Sincerely,

Carolyn Masters
Carolyn Masters

RESPONSES

CM-1 The equipment required to predict the location of the plume more than a few hours after the test does not exist. However, such equipment is not necessary in order to understand what will ultimately happen to the HCl in the exhaust plume. Section 4.4 of the SFEIS discusses the cumulative effects of the ASRM testing program and specifically addresses the fate of HCl.

See CM-1.

CM-2 Data reflecting the current buffering capacity in the soils and waters found at SSC were presented and discussed in the SFEIS. MASA has also established a baseline water quality monitoring program that will continue to provide information on any changes in water quality resulting from ASRM testing. Please refer to Section 1.2 of the SFEIS.

CM-2

CM-3

EXHIBIT

ASRM SFEIS PUBLIC MEETING

WE WOULD APPRECIATE YOUR COMMENTS ON THE FOLLOWING:

- DID YOU FIND THIS MEETING HELPFUL? YES NO
- DID IT ANSWER ANY OF YOUR QUESTIONS/CONCERNS? YES NO
- WERE THE PRESENTATIONS INFORMATIVE? YES NO
- WERE THE MEETING FACILITIES ADEQUATE? YES NO
- COULD YOU EASILY HEAR? YES NO
- COULD YOU READ THE SCREEN? YES NO

ADDITIONAL COMMENTS:

I found the level of evidence from the FEIS in the NASA panel which addressed the environmental impact of 27,426,320 lbs of hydrogen chloride to be relevant over the local and carbon loads of Mount St. Helens during the 30 year test program.

Letter Number 16

from
Patrick J. Berrigan
Deutsch, Kerrigan & Stiles
New Orleans, LA

COMMENTS

RESPONSES

DEUTSCH, KERRIGAN & STILES
1100 PEARSON DRIVE, SUITE 1000, NEW ORLEANS, LA 70112

768 MAGAZINE STREET
NEW ORLEANS 70130-3872

TELEPHONE 804 801-8144
CABLE ADDRESS DEMEST
TELETYPE 804/800-1801

ST. TAMMANY OFFICE
88 WILKINSON BOULEVARD
SLIDELL, LA 70458-1888
TELEPHONE 804 841-1870
FACSIMILE 804 841-1870
P.O. BOX 1000
SLIDELL, LA 70458-0210

PJB-1 **Response to STILES is noted.**

September 4, 1990

Mr. Lon Miller
ASRM Project Manager
NASA
John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

Re: Public Meeting
ASRM Slidell
August 30, 1990

Dear Mr. Miller:

Please be advised that I support the above recited program as outlined at the recent public hearing. I am sure that all citizens of this area share with you a care and concern for our environment. I believe that your study indicates that the testing of these engines will not cause damage to the wetlands of my state.

I have been involved in the development of multi thousand acres of land in south Louisiana. I must advise you that I thought that the manner in which your public hearing was conducted was exemplary in all ways. Bill Huseonica did an outstanding job as moderator for this very important project.

I would like to welcome you and all connected with the program to southeast Louisiana. Many of us yearn for more jobs for our children and this has been provided for by your project.

Very truly yours,
Patrick J. Berrigan
Patrick J. Berrigan

PJB-1

PJB:blc

Letter Number 17

from
Kenneth W. Holt
Department of Health & Human Services
Atlanta, GA

COMMENTS

RESPONSES

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333
August 31, 1990

KWH-1 Response to SFEIS is noted.

National Aeronautics and Space Administration
Attn: GAOO/Rebecca C. McCaleb, Ph.D.
Environmental Projects Officer
John C. Stennis Space Center
Stennis Space Center, Mississippi 39529-6000

Dear Dr. McCaleb:

On August 28 we mailed you our comments on the NASA Supplemental Final Environmental Impact Statement (SFEIS). Inadvertently, that letter did not include comments from another reviewer who wishes to review this document.

Since the review period extends through September 28, 1990, please be advised that we will send a second letter incorporating any additional comments prior to that date. We will be responding on behalf of the U.S. Public Health Service.

Thank you for the opportunity to review and comment on this document.

Sincerely yours,



Kenneth W. Holt, M.S.E.H.
Environmental Health Scientist
Center for Environmental Health
and Injury Control

KWH-1

Letter Number 18

from
Victor W. Lambou
Florida State University
Tallahassee, FL

COMMENTS

RESPONSES



The Florida State University
Tallahassee, Florida 32306-4016

Center for Biomedical & Technological Research and
Hazardous Waste Management
361 Bellamy Building
(904) 644-5124

August 21, 1990

Dr. Rebecca C. McCaleb
Environmental Projects Officer
National Aeronautics and Space
Administration
Bldg. 1100
Stennis Space Center MS 39529-6000

Dear Dr. McCaleb:

Thank you for forwarding me a copy of the Supplemental Final Environmental Impact Statement on the Space Shuttle Advanced Solid Rocket Motor Program (Doc. # 13). Even though the Supplemental Impact Statement was in an envelope addressed to me at Florida State University, the transmittal letter was addressed to Dr. Bernia C. Chevis, Chief of Staff, Hancock Medical Center, Bay St. Louis, MS (copy enclosed). The acknowledgement of receipt of the Supplemental Impact Statement form was forwarded to you under separate cover. I assume that the transmittal letters were mistakenly switched between the envelopes addressed to me and Dr. Chevis and that Dr. Chevis did receive a copy of the Supplemental Impact Statement; however, you may wish to make sure that this, in fact, is true.

I have read the Supplemental Impact Statement, including Appendix A, Wetland Mitigation Report, with great interest. In my opinion, you and your staff have produced, under very trying circumstances, a well-written first-rate document that presents a reasonable and balanced view of the potential scenarios involving testing of the rocket motor.

I would like to again thank you for the courtesies you extended to me and time spent with me discussing the Environmental Program at the Stennis Space Center during my visit there this past spring. We are most interested in your program and, if we can be of any assistance, I hope you will call on us. At your convenience, I would like to discuss with you possible follow-on activities relative to the Mitigation Plan.

Thank you for affording me the opportunity to examine the Supplemental Impact Statement.

Sincerely,
Arthur W. Lambou
Arthur W. Lambou, Director, Environmental
Monitoring & Wet Environments

VWL-1 Response to SFIS is noted.

VWL-1

Letter Number 19

from
Kenneth W. Holt
Department of Health & Human Services
Atlanta, GA

COMMENTS

RESPONSES

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333
August 28, 1990

KH-1 Response to SPEIS is noted.

National Aeronautics and Space Administration
Attn: GAOO/Rebecca C. McCaleb, Ph.D.
Environmental Projects Officer
John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

Dear Dr. McCaleb:

We have completed our review of the NASA Supplemental Final Environmental Impact Statement (SFEIS) for the Space Shuttle Advance Solid Rocket Motor Program. We are responding on behalf of the U.S. Public Health Service.

We have review this SFEIS with special attention to the discussion of human health concerns. We concur that no significant adverse effects on public health should result from emissions of aluminum compounds during the proposed test program.

Thank you for the opportunity to review and comment on this document. Please insure that we are included on your mailing list to receive a copy of the Final EIS, and future EIS's which may indicate potential public health impact and are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,



Kenneth W. Holt, M.S.E.H.
Environmental Health Scientist
Center for Environmental Health
and Injury Control

Letter Number 20

from
Bruce Pennington
Bay St. Louis, MS

COMMENTS

RESPONSES

BBP-1 Response to SPEIS is noted.

Aug. 30, 1990
NASA Environmental Officer
Stennis Space Center

Dear Sir:

I am a retired senior citizen who lives in Diamondhead, and very frankly had fears about the ASRM testing. The meeting at the Quality Inn last evening allayed my fears. It is time to put the protests and protesters to rest. The meeting was done in a very professional manner, and as far as I am concerned all questions were answered to the satisfaction of all. All the people who represented you obviously know their business.

Mr Rogers, Mr Miller, and Dr. McCaleb, and the people from EBASCO were very patient in answering the questions. I am sure it is easy to let the meeting degenerate into a shouting match, which is what some of the more rabid people want. Again, my compliments to all of that group. May you have all successes in your endeavor with the ASRM project.

Sincerely

Bruce B Pennington
782 Maui Pl.
Bay St. Louis Ms. 39520

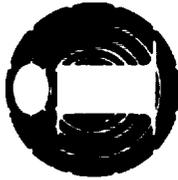
BBP-1

Letter Number 21

from
Randy B. Shaw
Interpine Lumber Co.
Picayune, MS

COMMENTS

RESPONSES



interpine

BOX 1837
PCATUNE, MISSISSIPPI 39448
601-788-6883 (7L)

August 14, 1990

Dr. Rebecca C. McCaleb
Environmental Officer
National Aeronautics and Space Administration
Building 1100
Stennis Space Center, MS 39529-6700

Re: Supplemental Final EIS ASRI

Page 4-51 Section 4.3
Impacts under case 2 conditions

RBS-1

Afternoon test firing during summer months will likely encounter case 2 conditions several times during the projects life. That will be the effects on soil and water of repeated testing during case 2 conditions?

RBS-2

Also, no provisions are mentioned in the EIS for advance notice of testing to forestry and logging crews working in buffer zone areas adjoining NASA fee area. Forestry crews are in the buffer zone almost daily. Sufficient notice should be given to enable alteration of work plans so workers will avoid being in the area during and after testing.

Sincerely,

Randy B. Shaw, Forester
INTERPINE LUMBER COMPANY

RBS/jm

RBS-1

The Case 2 condition is considered "unexpected" because it involves testing during unstable weather conditions and a complete lack of knowledge of the current weather conditions. ASRI testing will be conducted only when the weather conditions are such that no rain will fall within 2 to 4 hours after the test. Additionally, testing will not proceed if rain is falling at the site in the hours prior to a test.

Forecasting the potential for rainfall 2 to 4 hours in advance consists primarily of measuring the conditions in the atmosphere at the time of the forecast. Although the weather may change in a few hours, indications of these changes are always present in the meteorological data. These data are readily available from the onsite weather station at Stennis, which includes upper-air measurement equipment (weather balloons), the nearby weather station at Slidell, Louisiana, and regional weather data from the National Weather Service and satellites. Certified meteorologists can easily determine the atmosphere's potential to produce rain within a few hours from these data with a very high degree of certainty. The accuracy of this short-term weather forecasting is much higher than the 24- to 48-hour forecasts because the short-term prognosis only needs to consider the weather conditions in the vicinity of the site and does not involve computer model predictions. Twenty-four- and 48-hour forecasts routinely base their predictions on computer models which must rely on the relatively sparse data over the Gulf, in Mexico, and other areas beyond the U.S. borders. A discussion of NASA's plans for an environmental assurance program were provided in Section 1.2 of the SFEIS.

The meteorological conditions in southern Mississippi are often conducive to the development of convective (cumulus) clouds and frequently result in heavy rains. Because of the daily wind patterns on the coast of Mississippi, this convective activity generally occurs in the afternoon. These conditions are readily identified by analysis of the meteorological data collected at SSC, Slidell, and other regional stations. When such conditions exist in the vicinity of SSC, testing will not proceed. This protocol applies to testing at all times of the year and any time of day, not just during summer afternoons. Therefore, it is not likely that the Case 2 scenario will occur.

Regardless of the potential for a Case 2 scenario, the very low frequency of these tests and the long periods of time in-between tests will allow any exposed areas to

fully recover from even the most severe exposure such as that described as Case 2 of the SFEIS. Any temporary increase in water acidity will rapidly neutralize, resulting in no long-term effects. Any additional acid deposition to soils will also be neutralized and will not result in any long-term effects to soils or plants.

R88-2

The FEIS addressed the health and safety of workers within the buffer zone during testing. The health and safety considerations are primarily concerned with noise, explosions, and exposure to leaks of hazardous compounds. Since the exposure to individuals from routine testing is expected to be insignificant, no special precautions have been developed for workers not directly associated with handling of hazardous materials or workers within the Fee area. This policy has substantial empirical support from the testing program at the Thiokol facility in Utah. Thiokol has been manufacturing and testing SRMs onsite for more than a decade. The manufacturing facility at Thiokol employs hundreds of workers and is located only a few miles from either of two test stands. In addition, residences and agriculture are located within a few miles of the site. No workers or residents have experienced any adverse health effects as a result of the static testing.

Advance notice of ASRM testing will be provided to the public through the news media such as television, radio, and print. Test schedules are tentatively set months in advance. Tests will only be conducted under weather conditions which will assure protection of humans and the environment. However, we understand your concern, and are willing to directly provide your company with schedules and updates.

Letter Number 22

to
Lydia Schultz
Waveland, MS

National Aeronautics and
Space Administration

NASA

John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

September 14, 1990

Reply to Attn of SFEIS02

Ms. Lydia Shultz
Lydia's Audubon Shoppe
600 Highway 90
Waveland, MS 39576

Dear Ms. Shultz:

Thank you for participating in the recent public meeting held in Bay St. Louis on NASA's Advanced Solid Rocket Motor test program. We appreciate your taking the time to attend the meeting and for sharing your concerns about the ASRM program with us.

I want to express again, Lydia, my personal commitment to ensure that this testing is conducted in a manner which will not harm the beautiful environment in which you and I and many of our families and friends live.

Enclosed is the latest communication we have received from the Mississippi Research Consortium Environmental Task Force that you requested. As you will see, the enclosed statement includes the names of the task force members and their respective fields. When I talked with Dr. Powe recently, he said that the group planned to meet twice a year but we have not been informed of any subsequent meeting dates. We do value the comments provided in the enclosure as supportive of our work to date.

If I can be of any further help to you in the future, please contact me.

Sincerely,



A. J. Rogers, Jr.
Director, Center Operations

Enclosure



Office of Vice President for Research

May 30, 1990

Dr. Rebecca McCaleb
NASA
Building 2423
Stennis Space Center
Stennis Space Center, MS 39529

Dear Dr. McCaleb:

Enclosed, finally, is a copy of the statement prepared by the Mississippi Research Consortium Environmental Task Force following the briefing on March 1, 1990. On behalf of the Task Force, I want to extend deepest appreciation for the excellent group of people which were drawn together to make this presentation. The briefing was well prepared, very thorough, and very informative.

Please let me know if I may provide additional information, and we look forward to continuing to work with you.

Sincerely,

Ralph E. Powe
Vice President for Research

pm

xc: Environmental Task Force
Chief Research Officers

**Mississippi Research Consortium
Environmental Task Force
Review of Environmental Issues: ASRM Testing Program**

On March 1, 1990, members of the Mississippi Research Consortium Environmental Task Force met with representatives of NASA/Stennis Space Center and various contractors for an update on environmental issues associated with the planned ASRM testing program. Based upon this briefing, and upon prior study of the issues, the Task Force makes the following statement.

First, it is believed that the regulatory agencies have well qualified scientists and engineers reviewing the plans for ASRM testing and possible environmental impacts, and the Task Force has confidence in the decisions of these agencies from a regulatory standpoint.

Secondly, the efforts of NASA relative to possible environmental impacts are to be applauded. Particularly commendable is the development of the supplemental Environmental Impact Statement. An excellent staff has been brought together for addressing the environmental issues, and this staff has developed an appropriate plan for dealing with the issues.

Finally, the Task Force will continue to assess the technical details associated with the environmental issues, and it is expected that recommendations will be forthcoming which will make the environmental program even more effective.

Task Force Members:

- *Ralph E. Powe, MSU (Chairman)
 - *David L. Wertz, USM (Chemistry)
 - Cass Parker, JSU (Chemistry)
 - A. K. Mohamed, JSU (Biology)
 - *William E. Walker, GCRL (Biology)
 - Wyman Dorough, MSU (Toxicology)
 - *Nicolas Aumen, UM (Biology)
 - Ralph Goodman, UM (Acoustics)
 - **Donald Hill, MSU (Chemical Engineering)
-
- * Attended march 1, 1990 briefing
 - ** Represented by George Lightsey at March 1, 1990 briefing.
Also attending March 1, 1990 briefing: Ray Sheetz, USM (Biology)

3/1/50

3

ATTENDEES

REFERENCE INITIALS	NAME	ADDRESS	PHONE NUMBER
RP	Ralph E. Powe	Miss. State Univ. P. O. Box 6343 Miss. State, MS 39762	(601) 325-3570
NA	Nick Aumen	Dept. of Biology Univ. of Miss. University, MS 38677	(601) 232-5804
BW	Bill Walker	Gulf Coast Research Lab P. O. Box 7000 Ocean Springs, MS 39564	(601) 872-4261
RS	Ray Scheetz	Dept. Biology-Science Univ. of Southern Miss. Hattiesburg, MS 39406	(601) 266-4757
DW	Dave Wertz	Univ. of Southern Miss. S.S. Box 5043 Hattiesburg, MS 39406	(601) 266-4702
GL	George Lightsey	Miss. State Univ. P. O. Box CN Miss. State, MS 39762	(601) 325-2279
LL	Larry Lewis	MS. Bureau of Marine Resources 2620 Beach Blvd. Biloxi, MS 36531	(601) 385-5884
GAC	Greg A. Carter	Science & Tech. Labs NASA/SSC	(601) 688-1918
BAD	Bruce A. Davis	NASA/SSC/SR	(601) 688-2042
JWE	Joel W. Estes	NASA/SSC	(601) 688-1960
RGM	Ronald G. Magee	NASA/SSC Code GA00 SSC, MS 39429	(601) 688-3655
RCM	Rebecca C. McCaleb	NASA/SSC Code GA00 SSC, MS 39529	(601) 688-3156
RPT	Ramona Pelletier		

Travis

STL/NASA/SSC

(601) 688-1910

REFERENCE INITIALS	NAME	ADDRESS	PHONE NUMBER
AJR	A. J. Rogers	Dir-Center Operations NASA/SSC GA00	(601) 688-2004
PJM	Pat J. McShea	Lockheed/SSC/Bldg. 1103	(601) 688-3660
MCD	M. C. Dawson	Sverdrup Tech, Inc. Bldg. 1100/SSC, MS	(601) 688-2785
WLD	Willard L. Douglas	Sverdrup-Env. Lab. Bldg. 2423/SSC, MS	(601) 688-3158
EEE	Ellen E. Eagan	Sverdrup-Env. Lab. Bldg. 2423/SSC, MS	(601) 688-3068
HRL	Hal R. Lambright	Sverdrup Tech, Inc. Bldg. 2204/SSC, MS	(601) 688-1828
MAP	Margie A. Pharr	Sverdrup Tech, Inc. Bldg. 2109/SSC, MS	(601) 688-3757 688-1858

11/15/89

ATTENDANCE ROSTER

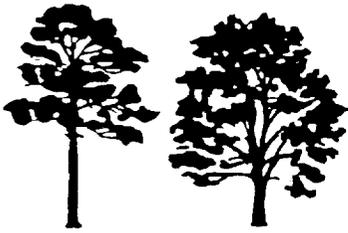
NAME/TITLE	ADDRESS	PHONE NUMBER
Nicholas G. Aumen Assistant Professor	Dept. of Biology Freshwater Biology Program University of Mississippi	601-232-5804
Patrick J. Kelly Project Manager EMIMS	HA42 Science & Technology Laboratory SSC, MS	601-688-1939
Willard Douglas Technical Lead Environmental Services Lab.	Bldg. 2423 SSC, MS	601-688-3158
Ralph R. Goodman Director, NCPA	P. O. Box 847 University, MS 38677	601-232-5817
Joel W. Estes ASRM Project	SSC, MS	601-688-1960
Ralph E. Powe Vice President for Research Miss. State University	P. O. Box 6343 Miss. State, MS 39762	601-325-3570
David L. Wertz Prof. Chemistry & Director Coal Product Research Center	Southern Station Box 5043 University Southern Mississippi Hattiesburg, MS 39406-5043	601-266-4701 266-4702

ATTENDANCE ROSTER

NAME/TITLE	ADDRESS	PHONE NUMBER
Gerald Smith Deputy Director, SSC	SSC, MS 39529-6000	601-688-2123
Rebecca McCaleb, Ph.D. Environmental Officer, SSC	Code GA00 SSC, MS 39529-6000	601-688-3156 688-2004
Ronald Magee Environmental Specialist	Code GA00 SSC, MS 39529-6000	601-688-3655
Linda Slade NASA Legal Office	Code CA00 SSC, MS 39529-6000	601-688-2164
Ken Human NASA Chief Counsel	Code CA00 SSC, MS 39529-6000	601-688-2164
Carroll K. Gorden	Andover Associates 120 Carroll Avenue P. O. Box 38 Bay St. Louis, MS 39520-0038	601-467-1714
Matt Hunter Pharm. Chemist	436 Waveland Avenue Waveland, MS 39576	601-467-7089

ATTENDANCE ROSTER

NAME/TITLE	ADDRESS	PHONE NUMBER
Dianne J. Love, Ph.D. Assistant Prof. of Biology	Jackson State University 1400 Lynch Street Jackson, MS 39217	601-968-2586
Johathan Wilson Director, Marine Science Program	Biology Department Jackson State University 1400 Lynch Street Jackson, MS 39217	601-968-2586
Cass D. Parker, Ph.D. Assistant Prof. of Chemistry Administrative Coordinator	Dept. of Chemistry P. O. Box 17910 Jackson State University Jackson, MS 39217	601-968-2171 968-2172 968-2173
Abdul K. Mohamed Prof. & Chair Biology Dept.	Dept. of Biology Jackson State University Jackson, MS 32917	601-968-2586
Clifford E. George Associate Professor Chemical Engineering	P. O. Box CN Miss. State, MS 39762	601-325-7205
William E. Hawkins for William W. Walker	P. O. Box 7000 Gulf Coast Research Laboratory Ocean Springs, MS 39564	601-875-2244
Wyman Dorough Toxicologist/Head	Dept. Biological Sciences Miss. State, MS 39762	601-325-7587



Forest Resources

Market Notes • Technical Notes • Research Notes • Newsletters

Extension Forestry Newsletter No. 33

September 1990

What Are BMP's?

For the past few months, many of you have been hearing about Best Management Practices or BMP's. If you are unsure exactly what this is all about, this short overview may help.

One of the main environmental concerns is water quality. Water pollution comes in two forms – point source pollution wherein the specific origin of the contamination can be identified, and non-point source pollution wherein there is no specific point of origin. Forest management activities may result in non-point source pollution.

BMP's are guidelines which are designed to minimize the non-point source water pollution resulting from forest management activities. Guidelines are provided for harvesting, road construction and maintenance, site preparation, streamside management zones, and vegetation of disturbed sites.

Who do these BMP's affect? The answer is everyone involved in forest management. In Mississippi, we are in a phase of voluntary compliance with our BMP's as proposed for Mississippi and as long as we maintain compliance with the guidelines, there should be no need of stringent government regulation as is found in western and New England states. In order for us to comply with the guidelines, it will take a cooperative effort of forest industry, state and federal forest agencies, and private landowners.

These BMP's affect all facets of forest management. If you have questions concerning this matter, see your county forester.

Good News About Acid Rain

For years, forest landowners have heard rumors of acid rain and the damage which could result. How bad is acid rain?

The National Acid Precipitation Assessment Program released its findings from a 10-year-long study involving numerous scientists and costing taxpayers \$100 million. Some of the findings which may surprise you include:

- Except for red spruce in high elevations, acid rain doesn't directly harm trees or other vegetation.
- Acid rain does put stress on trees, but it is minor compared to the stress caused by insects, root diseases, temperature, and ozone.
- Acid rain does affect lakes, though exactly how much is not understood. The study reports that putting lime in the lake is the most effective way to neutralize the acid.
- Some rains have been naturally acid even in areas where no acid rain falls.

Are We Losing Our Forests?

The U.S. has 743 million acres of forest land - more trees than we had 70 years ago. That is in spite of the rising demand for forest products to make paper, houses, furniture and other uses.

ORIGINAL PAGE IS
OF POOR QUALITY

Part of the reason for our successful system of forest renewal is that private forest landowners and forest industry together plant an average of 6 million trees every day. As a result we continue to grow more wood each year than is lost to natural causes and harvesting. In the U.S., private individuals own 58 percent of the commercial forest land while private industry owns only 14 percent.

Forestry Day in the South

Mark your calendars! On February 16, 1991, a series of landowner meetings will be held across the South. The theme for the meeting in Mississippi will be "Low Cost Forest Management."

A panel of speakers is being assembled to provide landowners with forest management options which could reduce the capital outlay in producing a crop of trees.

For more information on the meeting, contact your Area Forestry Specialist or the Extension Forestry Department, P. O. Box 5446, Mississippi State, MS 39762.

To Build A House

The average 1,800 square foot house requires 10,000 board feet of lumber for construction. This makes it easier to see why timber prices are so closely linked to the "new home construction" figures for the country.

Endangered Species in Mississippi

We occasionally hear about "endangered species" or "threatened species" and the government restrictions concerning these species. In Mississippi, we do not have as many endangered species listed as many other states. We have 4 birds, 3 reptiles, 1 fish, 3 mollusks, 2 plants, and 1 insect. The list of species and the counties they currently occupy is as follows:

Species	Current Occupied Counties
Birds	
Mississippi Sandhill Crane	Jackson
Bald Eagle	Harrison, Warren
Red-cockaded Woodpecker	Amita, Forest, Franklin, George, Greene, Harrison, Jackson, Jasper, Jones, Nock- bee, Oktibbeha, Perry, Scott, Smith, Stone, Wayne, Wilkinson, Winston, Han- cock, Harrison, Jackson
Brown Pelican	Hancock, Harrison, Jackson
Reptiles	
Gopher Tortoise	Covington, Forrest, George, Green, Hancock, Harrison, Jackson, Jones, Lamar, Marion, Pearl River, Perry, Stone, Wayne
Eastern Indigo Snake	Harrison, Stone
Ringed Sawback Turtle	Copiah, Hinds, Lawrence, Leake, Madison, Marion, Pearl River, Rankin, Scott, Simpson
Fish	
Bayou Darter	Claiborne, Copiah, Hinds
Mollusks	
Curtus' Mussel	Itawamba, Lowndes, Monroe
Judge Tait's Mussel	Itawamba, Lowndes, Monroe
Penitent Mussel	Itawamba, Lowndes, Monroe
Plants	
Pondberry	Bolivar, Sharkey, Sunflower
Price's Potato-bean	Clay, Lee, Oktibbeha
Insects	
Moss beetle	George

Publications of Interest

1. **Conserving and Managing Our Nation's Forest Resources.** Cooperative Extension Service Report. 19 pages, color. Provides overview of national efforts in resource management.
2. **America's Endangered Wetlands.** U. S. Fish and Wildlife Service. Fold-out color brochure/poster. Describes status of wetlands proposals for future.
3. **America's Wetlands: Our Vital Link Between Land and Water.** EPA color 10-page book. Provides overview of national wetlands status.
4. **Managed Forests and Clean Water.** USDA Forest Service Program Aid No. 1429. 8 page brochure on BMP's and water quality.
5. **Watershed and Air Management.** USDA Forest Service Program Aid No. 1432. Fold-out color brochure on resource conservation.
6. **Climate Change and America's Forest.** USDA Forest Service Gen. Tech. Rep. RM-187. Twelve-page publication on potential shifts in the forest resulting from major environmental changes.
7. **A Quarter-Century of Selection Management on Mississippi State Farm Forestry Forties.** MSU/MAFES Technical Bulletin 164. A 24-page booklet on the production history of forties using different management schemes.

Single copies of the above publications are available upon request. Write to Dr. Andy Ezell, Extension Forestry Department, P. O. Box 5446, Mississippi State, MS 39762.

County Forestry Shortcourses

Starting Date	County	Contact
Sept. 4	Copiah	Warren Dievert (894-4081)
Sept. 10	Winston	Frank Ainsworth (733-3091)
Sept. 13	Yalobusha	Steve Cummings (675-2730)
Sept. 17	Rankin	Barney Tanner (825-1461)
Sept. 18	Tate	Steve Richardson (562-4274)
Sept. 24	Monroe	David Roberts (369-4951)
Sept. 27	Marion	Barry Wallace (736-8251)
Oct. 2	Wayne	Dan Jones (735-2243)
Oct. 9	Marshall	Ronnie Jones (252-2541)
Oct. 15	Montgomery	Walter Alford (283-4133)
Oct. 23	Adams	Donald Smith (445-8201)
Oct. 25	George	Kerry Johnson (947-4223)
Nov. 5	Madison	Frank Carter (859-3842)


Andrew W. Ezell
Forestry Specialist

NOTICE!! NOTICE!! NOTICE!!

A hardwood management shortcourse will be held September 17-20. The topic will be Artificial Regeneration of Hardwoods. The brochures announcing this shortcourse did not get mailed to everyone as planned. This course will not be taught again for the foreseeable future, so if you want to attend this one, please call the Extension Forestry Department at (601) 325-3150. We apologize for any inconvenience, but you must respond quickly.

Letter Number 23

to
Buzz Nowak
Pearl River, LA

National Aeronautics and
Space Administration



John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

Reply to Attn of

SFEIS03

September 14, 1990

Mr. Buzz Nowak
520 Oak Alley
Pearl River, LA 70452

Dear Mr. Nowak:

Thank you for participating in the recent public meeting held in Slidell on NASA's Advanced Solid Rocket Motor test program at Stennis Space Center. We appreciate your taking the time to attend the meeting and for sharing your concerns about the ASRM test program with us.

You requested information on the projected acoustical vibrations of ASRM testing. Enclosed is a chart showing the predicted overall noise contours for ASRM testing at Stennis. For your further information, when the decision was made in the 1960's to locate the NASA testing facility in South Mississippi and South Louisiana, the restrictive easement in the land surrounding SSC, commonly referred to as the Buffer Zone, was configured to preclude damage to habitable structures based upon the projected impacts of the rocket test articles producing much larger sound (noise) than that generated by the ASRM.

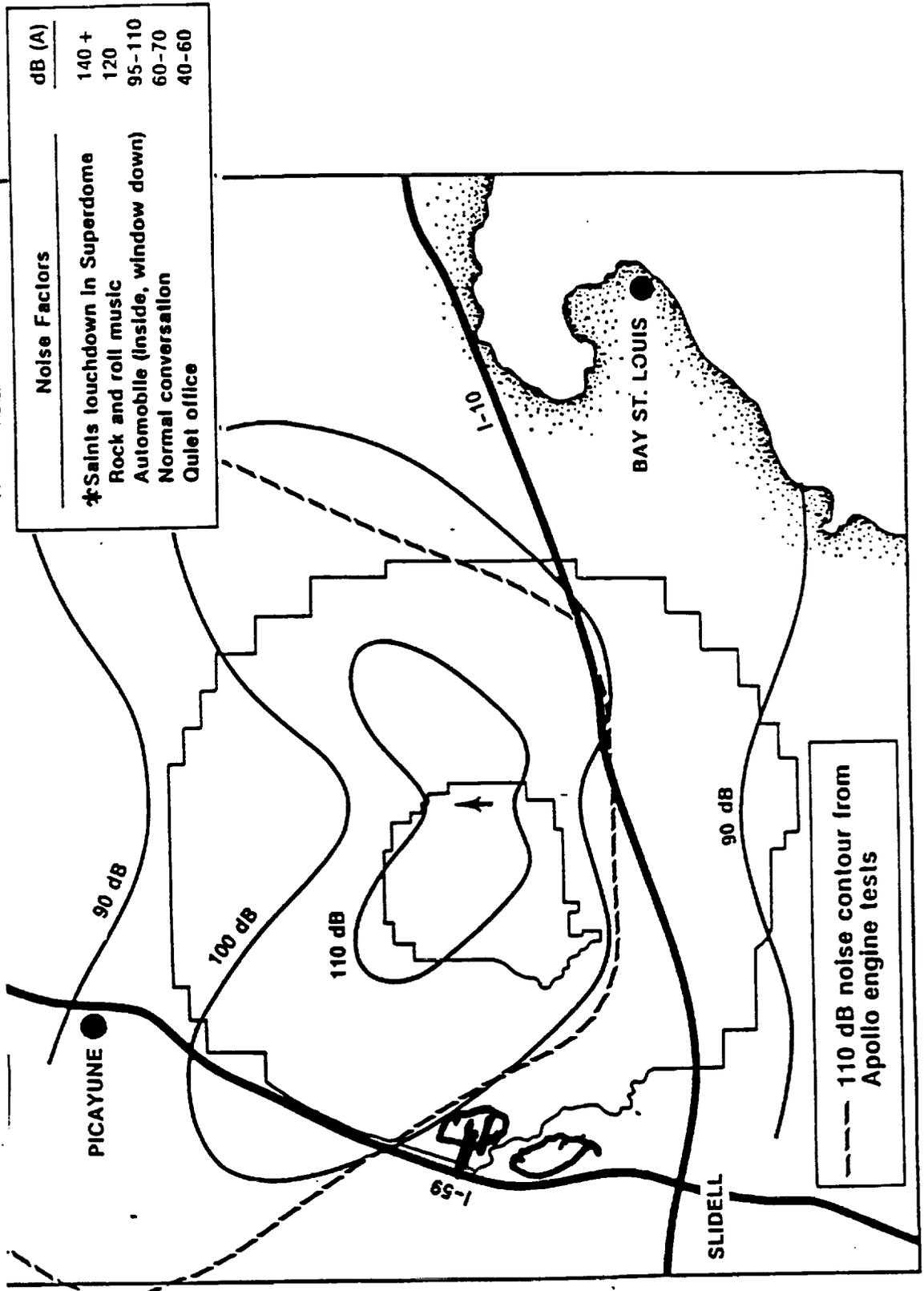
Again, Mr. Nowak, we appreciate hearing your concerns. If I can be of any further help to you, please contact me.

Sincerely,

A. J. Rogers, Jr.
Director, Center Operations

Enclosure

PREDICTED OVERALL NOISE CONTOURS FOR ASRM TESTING AT SSC



Letter Number 24

to

Carolyn Masters
Hattiesburg, MS

National Aeronautics and
Space Administration



John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

Reply to Attn of SFEIS05

September 12, 1990

Ms. Carolyn Masters
76 Shady Lane
Hattiesburg, MS 39402

Dear Ms. Masters:

Thank you for participating in the recent public meeting held in Picayune on NASA's Advanced Solid Rocket Motor test program at Stennis Space Center. We appreciate your taking the time to travel to Picayune and for sharing your concerns about the program with us. We also appreciate your kind remarks of support and interest in America's space program.

You requested information on additional surveys of federal endangered plant and animal species in the area and other critical season surveys. We expect the fall surveys to be complete by November with final reports issued in December. Reports of the spring surveys will be issued in June, 1991. I will see that you receive a copy of them. You also asked for the date of the formal ASRM public hearing. The Mississippi Bureau of Pollution Control has not yet announced the date, but we will let you know when the meeting is scheduled.

Again, Ms. Masters, we appreciate hearing your concerns. We, too, want a safe and productive space program. Please contact me if I can be of any further help to you.

Sincerely,

A. J. Rogers, Jr.
Director, Center Operations

Letter Number 25

to
Yvonne Hooge
New Orleans, LA

National Aeronautics and
Space Administration



John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

Reply to Attn of SFEIS01

September 12, 1990

Ms. Yvonne Hooge
4835 East View Drive
New Orleans, LA 70126

Dear Ms. Hooge:

Thank you for participating in the recent public meeting held in Slidell on NASA's Advanced Solid Rocket Motor test program at Stennis Space Center. We appreciate your taking the time to travel to Slidell and for sharing your concerns about the ASRM test program with us.

Enclosed is a map of the Stennis Space Center property and buffer zone in relation to southern Mississippi that you requested during the meeting.

Again, Ms. Hooge, we appreciate hearing your concerns. If I can be of any further help to you, please contact me.

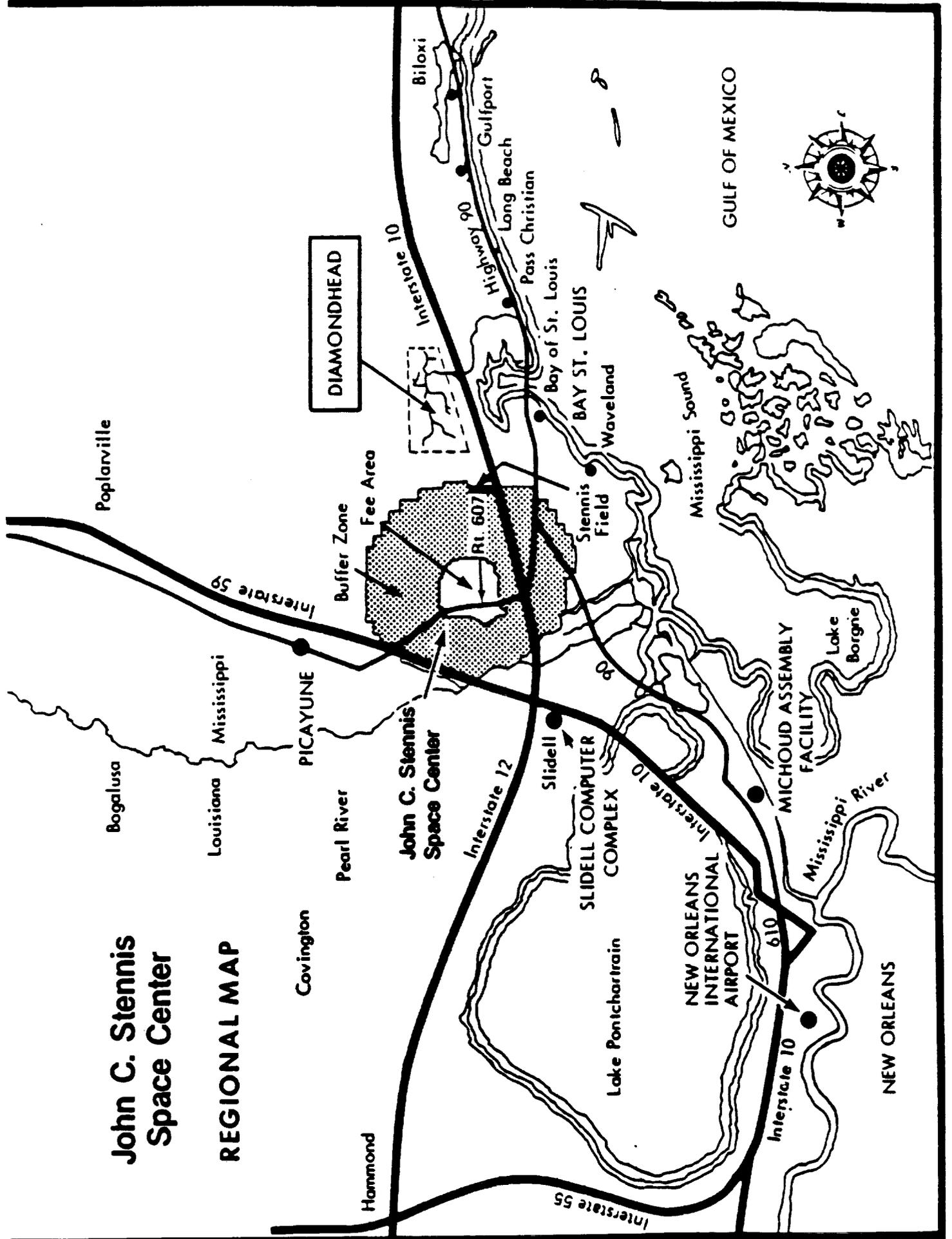
Sincerely,

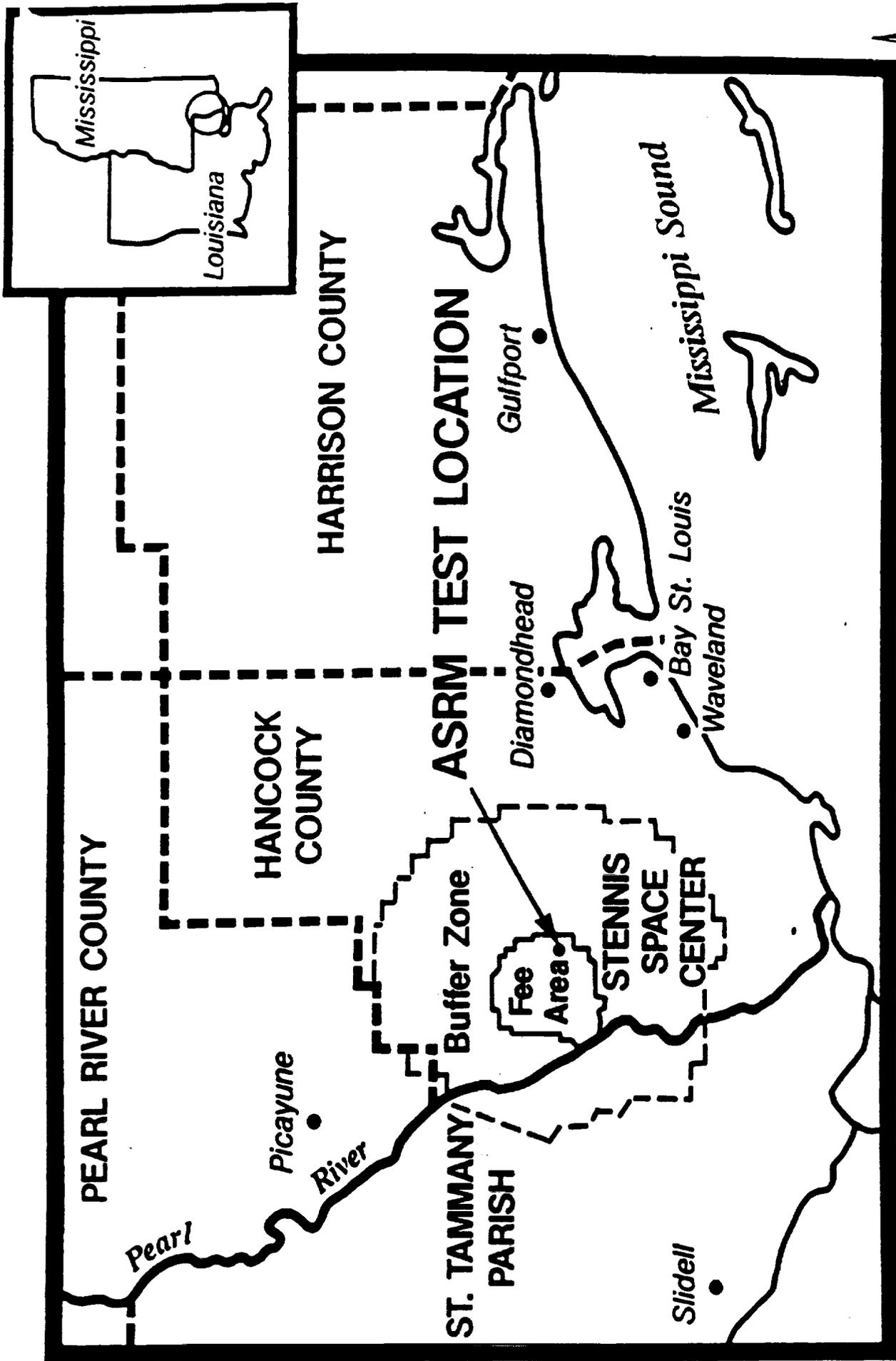
A. J. Rogers, Jr.
Director, Center Operations

Enclosure

John C. Stennis Space Center

REGIONAL MAP





MILES

Letter Number 26

to
Barry Bagert
Covington, LA

National Aeronautics and
Space Administration



John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

Reply to Attn of SFEIS04

September 12, 1990

Mr. Barry Bagert
St. Tammany Parish Police
Jurors Office
P. O. Box 628
Covington, LA 70433

Dear Mr. Bagert:

Thank you for participating in the recent public meeting held in Slidell on NASA's Advanced Solid Rocket Motor test program at Stennis Space Center. We appreciate your taking the time to attend the meeting and for sharing your concerns about the ASRM test program.

We have noted your request that NASA inform the St. Tammany Parish Police Jury and Slidell city officials of all ASRM tests. We will be happy to give you prior notification of any ASRM tests at Stennis Space Center. The first test won't be conducted until 1994. Within six months of the first test, someone from Stennis Space Center will contact your offices to set up proper communications on your request.

Again, Mr. Bagert, we appreciate hearing your concerns. Please contact me if I can be of any further help to you.

Sincerely,

A. J. Rogers, Jr.
Director, Center Operations

REFERENCES

- Army Corps of Engineers (ACOE). 1989. Memorandum of Agreement (MOA) between the Environmental Protection Agency and the Department of the Army concerning the determination of mitigation under the Clean Water Act Section 404(b)(1) Guidelines. Distributed by Patrick J. Kelly, Brigadier General, Director of Civil Works, U.S. Army Corps of Engineers, Washington, D.C.
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